

Technology Review

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*RUSSIAN
GO-GETTER*

*LIGHTMAN'S
UNCERTAINTY
PRINCIPLE*

ARTIFICIAL LIFE

*REORDERING
SCIENCE ED*

APOCALYPSE NOT

*A REPRIEVE FOR
POWER LINES*



technology review

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BY LEON M. LEDERMAN

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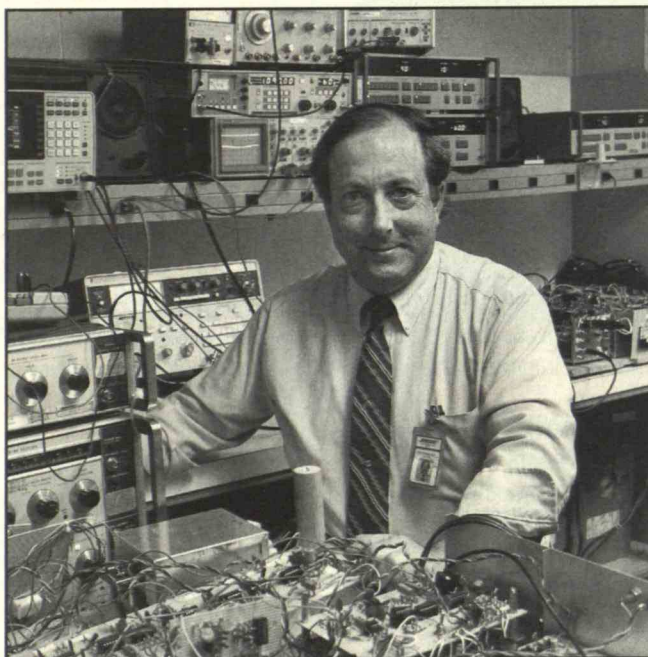
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First Line

CINEMA TECH

*If surgeons, tax lawyers,
and other unlikely
professionals can inspire
successful TV shows,
why can't engineers?*

MILLIONS of television viewers enjoy the dramatic power of *ER* and *Chicago Hope* despite the medical jargon and complex situations that often prevail. The career adventures of a top-of-the-line cardiothoracic surgeon, for example, might seem a bit esoteric, yet the public obviously sympathizes.

Another popular series, *NYPD Blue*, presents a similar paradox. This police show, like the doc shows, is often quite technical in its professional intrigues. But in both cases the characters are down to earth and their stories address provocative themes of universal appeal. Though relatively few of us perform coronary bypasses or solve major crimes, we can't help but believe in and care about these people. And along the way we gain a little more respect for what real medical practitioners and police detectives do, having been reminded not to take their routine but considerable achievements for granted.

Televisionland could use a similar show based on the aspirations and adventures of engineers, who also address provocative themes of universal appeal as an intrinsic part of their work. Indeed, such a show could be part of a whole new genre embracing feature-length films as well. "Cinema tech" could provide a new source of fascinating and entertaining stories for public consumption while also serving the engineering profession.

Lord knows the public image of technologists could use some enhancement. Although often regarded as workers of high-tech miracles, engineers tend to be stereotyped as unattractive, humorless, barely human geeks whose work, at least in its day-to-day processes (as opposed to its ultimate products), arouses little general interest. Such widespread ignorance of the mystery, pleasure, and relevance of engineers' efforts—on projects that are necessarily long-term, unpredictable, and in steady need of tender loving care—are one reason why the public, through its political representatives, has lately been putting the financial squeeze on R&D.

In "Getting High-School Science in Order," physicist Leon M. Lederman points out in this issue of *Technology Review* that a fundamental way to combat such illiteracy is to reform the teaching of the basics. He prescribes in particular a three-year sequence of courses—concentrating on, but not limited to, physics,

chemistry, and biology, in that order—designed to build knowledge of science and its applications in a step-by-step and cumulative fashion. Such an approach would provide experiences, Lederman maintains, that stimulate rather than turn off high-school students and put them well on the road to becoming informed and responsible citizens in a technology-based society.

These kinds of reforms could serve as a foundation on which to build, as Lederman envisions, an "American renaissance," and not just in science- and technology-related matters. But such changes are neither quick nor easy. In the meantime we might pursue complementary innovations—such as cinema tech—that are more readily achievable if only because they require fewer decision makers.

If you scoff at the idea of popularizing the practice of engineering—what could be slower and less dramatic, after all, than the years of patient labors and dead ends that usually precede technological advances?—consider the wild popularity a few years ago of *L.A. Law*, as well as the established genre of legal/courtroom dramas of which it was a part. The stereotype of the lawyer is no more glamorous than that of the engineer, and the grindings of the law are no faster than that of R&D. Actually, day-to-day activity in hospitals and police stations is mostly mundane as well, punctuated only occasionally by the kinds of intense conflict of which drama is made. It takes the imagination of writers, directors,

actors, and the many others who make movies and TV shows to spin a good yarn, keep us in our seats, and—if they're drawing on quality material—touch our hearts and improve our minds.

Happily, there is no shortage of such material when it comes to technology. Engineers exert an impact on just about everything human beings do because they devise the products and services we employ in doing it. They affect where we live, what we eat, and how we travel, communicate, work, and play. They protect and improve (and sometimes degrade) our environment, both natural and social. They influence our health, physical as well as mental. They marshal the energy sources that keep us warm, cool, and constructively occupied. They investigate disasters, acts of both God and humanity, and try to forestall future damage. Whether building a vehicular highway or an information highway, technologists spawn dramatic results, and their lives could be the stuff of drama as well—or readily made so with the kind of creativity that has long enhanced the images of doctors, cops, and lawyers.

Unfortunately, as *TR* columnist Samuel C. Florman has written in his acclaimed book *The Existential Pleasures of Engineering*, this is a profession that "lacks poets within its ranks." But so do many of the other professions that have inspired artistic and entertainment genres. "The engineer," says Florman, "may merely be waiting for his Shakespeare."

Technologists could use a few Chekhovs and Ibsens and Woody Allens, too. But we need not twiddle our thumbs until the poets arrive. As journalist Daniel S. Greenberg wrote in *TR*'s February/March issue ("Scientists Must Join the Fray"), the community can take the initiative. Organizations oriented toward engineering, not only professional societies but also companies and universities, for example, might actively commission and work with writers and other media professionals to convert such goals into reality. The benefits could include new creative (and economic) opportunities for the film and broadcast industries, a better-informed public that appreciates and supports the science and technology community, and a wider range of cultural options. ■

—STEVEN J. MARCUS

fuel. As known oil reserves begin to peak and level off in the next 20 years, a sharp increase in the price of gasoline will draw more attention to the need for an electric transportation alternative.

CLARK W. GELLINGS
Vice-President, Customer Systems
Electric Power Research Institute
Palo Alto, Calif.

"The Electric Car Unplugged" was most timely. In late December 1995, the California Air Resources Board directed its staff to prepare regulations that amend the EV mandate. This change lays the groundwork for what we believe is a sensible and environmentally sound approach to meeting not only California's air quality needs, but the nation's as well. Your article anticipated many elements in the proposal, including:

- Suspension of the mandate to produce EVs based on the finding that batteries likely to be available in the next five to six years will not provide the range that customers require at an affordable cost.
- A focus on obtaining cleaner gasoline-powered vehicles. The migration effect of cleaner cars in California will do more for air quality in the near-term than EVs would.
- Formation of a partnership to develop advanced batteries with power densities more likely to meet the needs of a greater number of customers.
- A partnership structure—a national program led by California—to help ensure that efforts are not diluted by a proliferation of unique EV programs in other states.
- A science-based review process to ensure that immature technology is not forced on customers.

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JOHN P. MCTAGUE
Vice-President, Technical Affairs
Ford Motor Co.
Dearborn, Mich.

MISGUIDED SPENDING

I disagree with Harvey Sapolsky's suggestion in "The Truly Endless Frontier" (*TR* November/December 1995) that we use fear of illness and death, instead of fear of the Russians, as a rationale for funding science with public dollars. If every American enjoyed excellent health and lived to be 200 years old then no one would complain that 14 percent of the U.S. gross domestic product is spent on health care. Unfortunately, Americans face higher health care costs and have less access to health care than the citizens of other developed nations, yet our health is not demonstrably better. This situation has arisen despite, and in some senses because of, American scientific and technological initiatives in health care. Sapolsky lauds the 20-year-



old campaign to conquer cancer, but this scientific effort has cost the U.S. taxpayer about 1 billion inflation-adjusted dollars annually, while age- and sex-adjusted cancer death rates remain essentially unchanged. If this

money had been spent on simple preventive measures such as reducing tobacco use, hundreds of thousands of lives might have been saved every year.

Sapolsky is correct when he says that R&D spending is only a small part of the total health budget, but the new technologies created by R&D are responsible for a substantial part of the persistent rise in health care costs. This technological process has not created a health benefit proportionate to its cost.

If science is to improve the quality of life for society as a whole, and not just for scientists and research universities, then public dollars must be allocated through the democratic process. If curiosity-driven scientists capture future tax dollars through the elitist program supported by Sapolsky, health care costs may continue to rise without corre-

sponding improvements in health. At the same time, dollars will be diverted from simple but effective approaches to improving the overall health of the public. The result will be a health care system, and a scientific establishment, that becomes increasingly tarnished in the eyes of the public, which I am sure is not what Sapolsky wants.

JAMES A. COWAN
Chief of Medicine
St. Luke's Hospital
Bethlehem, Pa.

FUND WITH CARE

Several articles in the November/December 1995 issue seem to share a common thread that should be anathema to an objective publication such as *Technology Review*.

Lawrence Grossman approaches "Maintaining Diversity in the Electronic Republic" with an exceedingly transparent agenda. He observes that "under the present, commercially driven system, such [quality] TV programming has become the rare exception rather than the rule." Grossman would do well to recall that we are living in the United States, a capitalist country, where commercial gain is not just accepted but welcomed. He suggests that "the nation needs an independent public telecommunications trust fund." I seriously question the need for public money—specifically my tax dollars—to fund media of any sort. To put the final nail in the coffin, Grossman is announced as the "president of the forthcoming PBS Horizons Cable Network." His self-serving infomercial should have been paid for and presented as advertising.

Further undermining *TR*'s credibility is Harvey Sapolsky's article, "The Truly Endless Frontier," on the declining public (otherwise known as taxpayer) support of basic research. While I am sure that Sapolsky and many others are worried about their future funding, nowhere does he attempt to make a case for the necessity of such support. As do most academics, he assumes that he has a right to such funds and merely needs to lobby Congress to regain them.

Similar to Sapolsky's article is Robert



M. White's column "Reshaping an R&D Jewel." While

White offers several suggestions on how to replace public funding for R&D, he never bothers to discuss the necessity of such funding.

If it is *TR*'s policy to advocate public funding of universities, let's at least have an intellectual debate. I find it very disconcerting that *TR* can make such a broad assumption and give so much attention to the "how" but none to the "why."

DAVID MCCLELLAND
Duluth, Ga.

Editor Steven J. Marcus's assertion that "researchers need a better strategy for fighting threats to federal funding" (*First Line*, *TR* November/December 1995) left me speechless.

In my day, MIT was a proud "independent" institution. My research during the 1940s was war-oriented by my choice—but not government-sponsored. In those days, private industry supported all types of research. Unfortunately, recent corporate buyouts of progressive and successful firms such as Goodyear and Philips have looted them of their research funds. Other companies have taken the hint and minimized the use of cash surpluses for research. Instead of subsidizing research with public funds, the government should provide incentives for private research—or at least protect it from predatory speculators.

RICHARD S. SCHMIDT
Houston, Tex.

THE PROBLEM WITH LEFTOVERS

In "Making Biomass Energy a Contender" (*TR* October 1995), George Sterzinger presents a potentially won-

derful energy future, but he overlooks a problem common to today's electricity plants that biomass facilities would also confront: the waste produced per unit of power. Sterzinger mentions that char, tars, and oils must be removed before the combustible gas reaches the turbine without telling us how great a disposal problem this could present. My guess is that the tars and oils in particular will have a high-enough fraction of toxic compounds that they'll require incineration at high temperatures. Building an effective incinerator would increase the capital cost of the plant, reduce the net yield, and possibly even ruin the economies of scale expected by the author.

I also wonder whether crops of fast-growing trees would exhaust what Sterzinger describes as already marginal land. Crops requiring fertilizer or rotation would impose another cost that would raise the price of biomass energy.

CHARLES J. HITCHCOCK
Brighton, Mass.

CYRUS CAME FIRST

While I enjoyed the information on Roger Schank's software in "AI as a Training Tool" (*Trends*, *TR* August/September 1995), I want to note that while his Fast Reading and Understanding Memory Program (FRUMP) read stories from the United Press International news wire, it was the Computerized Yale Retrieval & Updating System (CYRUS), a program I designed and wrote, that incorporated those stories into a knowledge bank and answered relevant questions. CYRUS was the forerunner of many similar autonomous reasoning systems. These systems were made interactive when Schank and his colleagues realized that people could adapt cases to come up with more interesting solutions to problems than computers could.

JANET L. KOODNER
Professor
Computing and Cognitive Science
Georgia Institute of Technology

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tures, with an onscreen agent. This, she believes, would be a milestone on the way to equipping computers with true "social interfaces." "The dominant metaphor for computer-human interaction these days is conversational: you're supposed to be able to talk to the machine, and it's supposed to talk back. But the people who've designed such interfaces thus far haven't fully exploited the metaphor." A real conversational partner, Cassell maintains, must do what humans do when they interact—interpret gestures. "It has to know that when I represent spatial information on both hands I'm drawing a contrast between two things. It has to know that if I say 'He went down the street' and my hands are bobbing up and down, I mean 'bounced,' even though I didn't say that."

A big challenge in designing a gesture-recognizing interface is enabling the computer to see what the user's hands are doing. One possibility relies on work done by Media Lab colleague Alex P. Pentland and his students, who have devised a video system that can follow the orientation of a person's palms. But fingers, which are crucial to gestures, are difficult to track because they are so small. Another solution may emerge from the work of the Media Lab's Neil Gershenfeld on magnetic force fields, which, when hands are thrust into them, "seem to do a good job of picking up changes in hand shapes."

In gesture generation and recognition, Cassell sees liberation. "To get computers to understand us," she says, "humans have learned to act like computers. We shape our behavior to an extraordinary extent when we sit down in front of a computer. But less and less so. Teaching a computer to interpret gestures is just another step toward *it* shaping *its* behavior."

A necessary step, or just frosting on the cake? "It may be frosting for people who already use computers a lot—though even they could work faster by getting simultaneous information across," says Cassell. "But consider the still vast set of people who *don't* use

computers. The ability to converse and gesture naturally may open up the world of computing to many more of them."

—DAVID BRITTAN

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A NEW WAY TO DIAGNOSE PROSTATE PROBLEMS

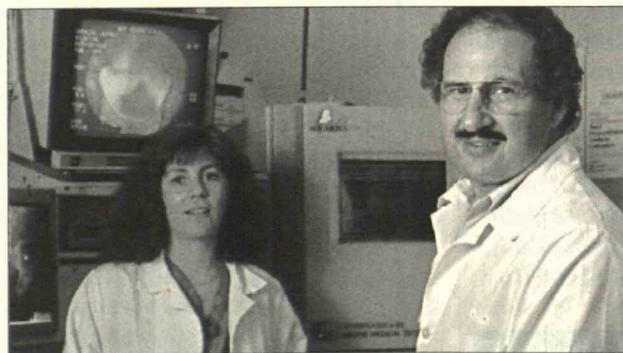


Typically unaware of the problem when young, men learn about urinary difficulties as they age. While at least one of every five 50-year-old men has a painful condition marked by a repeated, urgent need to urinate but an inability to emit much fluid, by age 75 that fraction has jumped to more than four of every five men, says Ernest G. Cravalho, a professor of mechanical engineering at MIT who has been studying the mechanics associated with the problem for 15 years.

Doctors diagnose most of these men as having a benign enlargement of the

But such diagnoses aren't always correct. According to Yalla, who's also chief of urology at the Brockton-West Roxbury (Mass.) Medical Center of Veteran Affairs, 30 percent or more of the symptomatic men who come to his clinic have problems other than prostatic obstructions. Members of this group who might be advised to try any of the treatments that are typical for a benign prostate problem—surgery that involves scraping away of prostate tissue, drugs that either relax or shrink the prostate, and "watchful waiting" to see what happens—would not find relief from them, he says.

In the early 1980s Yalla asked Cravalho to study the mechanics of the lower urinary tract and help develop an objective test for determining whether individual patients' urination problems relate to their prostates, and if so, just how. To devise a technology that would provide numerical data on any prostate problem, Cravalho first developed a model of how pressure levels and flow rates can change, under a wide variety of conditions, throughout the lower urinary tract. That system extends, by way



Maryrose P. Sullivan and Ernest G. Cravalho are among the researchers who have developed a technique to determine, without an internal probe, whether men with a painful urinary-tract condition have a prostate or a bladder problem.

prostate gland. Subbarao V. Yalla, an associate professor of urology at Harvard Medical School who works with Cravalho, says that today such evaluation may be reached after only two subjective exam techniques. These are routine questions about urination habits and internal probing with a gloved hand to feel for enlargement of the prostate gland. (During the same procedure doctors also feel for hard, discrete nodules, which could indicate prostate cancer.)

of the urethra tube, from the bladder through the doughnut-shaped prostate gland to the tight region of the sphincter muscle and finally out through the lower portion of the urethra. Norman R. Zinner, a clinical associate professor of urology at the University of California at Los Angeles School of Medicine, calls the development of such a "urodynamic" model "extremely complex" because components of the tract act like "floppy rubber tubing that can change shape as

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1. Manage tech transfer as a business strategy. You don't have to be a business to run like one: Stanford University's licensing office now earns tens of millions a year from royalties. Its strategic plan is posted on its Web site, complete with specific, measurable workflow and financial targets. (Of course you don't have to be a university to manage technology well.) The point is, are you making as much money from technology transfer as you could? **Technology Access Report** will show you how.

2. Treat your web of technology suppliers and customers as stakeholders and make them partners. Tech transfer is often called a contact sport—and last year our readers received over 500 expert contacts. You'll learn how your peers (and competitors) work and what their issues are. **Technology Access Report** is the only publication truly designed for this "mixed" network: new business development, R&D and licensing executives in companies of all sizes, in all industries; university, medical, independent and federal lab tech transfer managers; brokers, venture capitalists, dealmaking attorneys, economic development officials, entrepreneurs. . .

Even companies as rich in internal technology (and tradition) as 3M, IBM and GM are learning to partner. Amgen told us how it realized it had to reach outside again to fill its product pipeline. Then when the mouse "fat gene" was discovered, Amgen was ready to pounce (so to speak).

Our Calendar is the most comprehensive listing of tech transfer meetings—invaluable for budgeting your travel for the year.

3. Know thyself: technology, management, strengths, goals. If you don't know what you've got or where you want to go, how do you know what you need? Jeff Staley of Mercer Management Consulting explained to our readers that technology transfer should be integrated into a "technology asset plan."

Our subscribers at GTE, Northrop-Grumman and many more now evaluate non-strategic internal technologies for their out-licensing potential. Some, like Motorola, license-in; others, like Corning and Du Pont, are becoming adept at looking both ways before crossing the technology street.

3A. Performance assessment is inevitable. Do it yourself before it is done unto you. Your mission should determine your measures: royalties, licenses, jobs. . . **Technology Access** pioneered the use of normalized statistics, such as licenses per million dollars of research, to make it easier to compare institutions of different sizes.

By the way, the nation's 600 federal labs lag far behind the best universities on nearly all measures, including gross royalty dollars and licenses, and look even worse on a normalized basis. But watch out for miniaturized radar from Lawrence Livermore. It's a home run.

4. Benchmark—for new strategies, proven techniques, best practices. Some engineers say, "Just show us the technology, and we'll deal with the transfer later," yet without a realistic process they will lose valuable time and opportunity. On the other hand, bureaucrats in government or anywhere may be so obsessed with process that they too forgo results. The key: Manage the process toward a goal. Every issue of **Technology Access Report** presents a different mix of inspiring cases of technology leaders revealing how they structure their deals.

5. Know your technology—but scan the horizons. We all suffer information overload. Tempted to give in to the protective reflex to narrow your focus? Here's our advice: Don't! Technology fusion is creating surprising new threats—and opportunities.

Our "Washington Digest" keeps a watchful eye on federal legislation and

agencies. We let you in on the hallway conversations at the exclusive seminars where breakthroughs are whispered about—long before they hit the journals or the mass media—in biotechnology and healthcare, chemicals, sensors, manufacturing and materials, electronics, software. . .

6. Capitalize on opportunities in licensing, cooperative research. . . Act NOW. We provide selected, value-added, early information—opportunities: Every article ends with an easy-to-spot "Access block," with the names, telephone, fax and e-mail numbers of the people you need to know. Make your own deals—or expand your network. But do it now.

Of course there are other factors, but only you can supply the seventh. . .

7. Add passion to your technology transfer. John Preston led the MIT licensing office to a remarkable track record of start-ups (well over \$1 billion in market capitalization). His pseudo-mathematical formula equates the probability of success of a venture to the product of three variables: the quality of the technology, funding, and management. As any one approaches zero, the whole venture's chances decline.

Then John adds a novel coefficient to each factor—passion—the passion to make the venture succeed against all obstacles—on the part of the original inventor, the university or lab, management and investors. Several things can kill passion, thereby killing the deal: bureaucratic delay, and (all too often) lawyers. But the number one killer of passion is greed—on the part of any member of the team. Conversely, the new ventures most likely to succeed maximize passion for all the participants.

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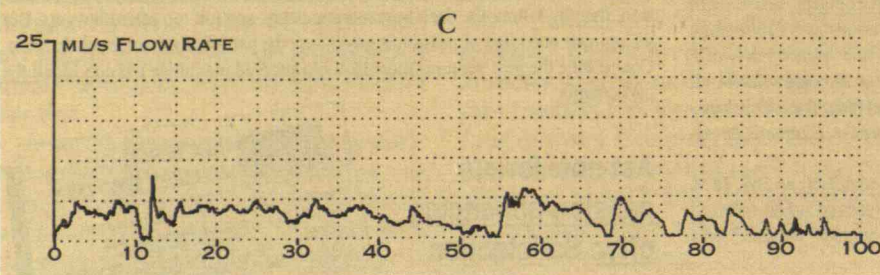
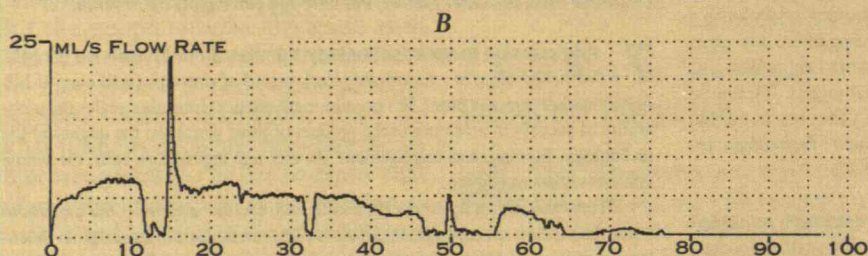
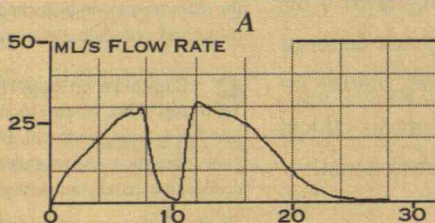
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A: The flow of a healthy young man who squeezed and released his urethra after beginning to urinate returned to its previous rate before quickly dropping off and finishing. B: For an older man who followed the procedure, the flow spike indicated that a prostate obstruction was momentarily pushed aside. C: An older man whose flow changed little after the technique suffered from bladder walls that didn't contract.



fluids go through" in different ways at different times. The system, he notes, is mechanically more complicated than the cardiovascular tubing through which blood flows.

Devising Reliable Tests

In the years since Cravalho created his model he has relied on information provided by it to develop a couple of objective tests. He initially created a catheter studded with some 40 electrodes that, when the device is inserted in the lower urinary tract, run the length of the urethra region. A pair of electrodes at one end passes a low-voltage current to another pair at the opposite end when fluid streams through the tract. The other electrodes, placed between the pairs and wired to an external computer, measure how the voltage drops as the fluid pushes through the urethra. At those places where the flow channel is more restricted, the urine's electrical resistance rises, leading to larger drops in voltage. Thus the voltage data translate

into a physical picture of the urethra canal that shows the precise site and extent of any constriction caused by prostate enlargement.

In the early 1990s Cravalho set aside that effort, which was successfully tested with dogs, to focus on a simpler objective approach that does not require unpleasant internal probing. Yalla and Cravalho, along with Maryrose P. Sullivan (a biomedical engineer and lecturer in the Harvard-MIT Division of Health Sciences and Technology), developed an external approach after looking at some unusual charts of one prostate patient. Unlike all other men Yalla had examined, this patient had flow rates that changed drastically and repeatedly during the course of every urination. Yalla learned that the man had discovered he could increase his flow by intermittently squeezing and releasing his urethra.

The Boston team recognized that such a "penile compression" technique could give useful information, although different from the results the catheter can provide. The external maneuver can show

whether a man has a problem with his prostate or the contractility of his bladder walls (a relatively common condition sometimes called truck-driver's bladder, in reference to truckers who try to save time by resisting the urge to pull over).

To analyze the situation, the researchers have a subject conduct the maneuver while urinating into a funnel, at the end of which is a flow meter; a computer wired to the meter produces a graph of the man's flow pattern. A diagram that shows a series of peaks suggests that the subject has a problem with his prostate. Temporarily cutting off the flow in the urethra creates a rise in pressure high enough that any obstruction momentarily gets pushed to the side. Alternatively, a graph that shows no peaks during the flow period indicates that the subject's bladder is not contracting appropriately, since the technique cannot alter the functioning of the bladder walls. Treatment recommendations for each of these cases would differ accordingly.

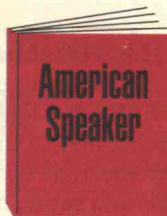
The Boston group is now trying to improve the approach, which Yalla announced at a professional meeting this past October, by developing a device that would squeeze the urethra uniformly and thus provide standard information about, say, the severity of a prostate problem. The researchers decline to provide details on the technology, which would be something like a blood-pressure cuff, while they prepare to apply for a patent. Yalla points out that other researchers are also devising similar technologies elsewhere.

Cravalho says his group's technique would provide more information to doctors who may have already performed the subjective workup and think surgery could be in order. Each year in the United States \$5 billion, much of that provided by the federal Medicare program, is spent on benign prostate surgery. According to Cravalho, more specifics about patients' conditions beforehand could reduce the number of unnecessary procedures and the money devoted to them.—LAURA VAN DAM

REVIEW

Applause, Applause

Anyone can win over a tough audience, says hailed speechwriter. Just ask Lee Iacocca.



**AMERICAN
SPEAKER**
*Your Guide to
Successful Speaking*

Aram Bakshian, Jr., Editor
Georgetown Publishing
House--600 pages

The difference between success and failure, writes Aram Bakshian, Jr. in this remarkable new resource for public speakers, is the ability to communicate clearly and effectively. Never has this been more true than in today's intensely competitive business climate.

Bakshian should know. Speechwriter to "The Great Communicator" himself, Ronald Reagan, as well as to two other former presidents and the heads of several major corporations, Bakshian has witnessed the rise and fall of international leaders based on their ease – or lack of ease – on the podium. Anyone can master the art of speaking in public, Bakshian says, "in the last analysis, the spoken word is still king."

Fear and loathing of the rubber chicken circuit have long plagued public figures. "No one knows how I hate making speeches," President Calvin Coolidge once complained to a friend.

Bakshian tackles head-on the challenges of public speaking in *American Speaker*. "As with alcoholism," he writes, "there is no known cure for stage fright. You're either a 'chronic' sufferer or a 'recovering' sufferer." In either case, it's easy to minimize that suffering – or even turn it into an advantage, as he deftly outlines. As Carroll O'Connor, the legendary "Archie Bunker," put it, "A professional actor has a kind of tension. The amateur is thrown by it, but the professional needs it."

Perhaps the best contemporary example is Lee Iacocca, who saved the Chrysler Corporation by using his enormous talent as a speaker to win the support of the Congress, the White House and the American people for the biggest corporate bailout in history. Iacocca himself attributes his

business success to speaking. In his autobiography he writes: "I've seen a lot of guys who are smarter than I am and a lot who know more about cars. And yet I've lost them in the smoke. Why? Because I'm tough? No...You've got to know how to talk to them, plain and simple."

Business is the single biggest rhetorical arena. From simple retail sales spiels to sensitive boardroom presentations, speech keeps the wheels of commerce turning. In making a first impression, Bakshian writes, "Your appearance can raise expectations, but what you say and how you say it will determine how people evaluate you." A good speaker is always in demand. At events from business conventions to weddings, "a good speaker not only adds to the occasion, he also benefits from 'free advertising' that adds to his stature in the community and attracts future business."

Unusual for a book or periodical of any kind, *American Speaker* is more of a personal mentor — a do-it-yourself guide designed to save hours or days of preparation time, or conversely, an enormous bill from a professional speechwriter or "coach."

It's a clever, accessible concept: a three-ring binder crammed with hundreds of pages of material on every imaginable aspect of public address: body language, delivering an inspiring eulogy, antidotes to nervousness, using humor, developing a powerful speaking voice, or engaging the audience in a positive question-and-answer session. Bakshian offers sensible, uplifting advice for every occasion, from the Thanksgiving toast to a defense of your industry before a hostile audience.

Arranged alphabetically, *American Speaker* is easy to navigate, highly entertaining and loaded with good ideas. In the calendars section, for instance, Bakshian compiles thousands of speech pegs for every day of the year in four calendars: celebrity birthdays, famous people of the past, today in history and the months at a glance. "Every audience gathered to share a com-

mon interest or celebrate a specific occasion has a built-in common bond," Bakshian writes. "A good speaker doesn't just know this; a good speaker takes advantage of it." He demonstrates how a shared reference can warm up the audience, draw a favorable analogy or build a bridge from past to present.

What about actual speeches? They're all over *American Speaker*. A section on acceptance speeches includes as an example Winston Churchill's masterful appearance before Parliament in 1954, on the occasion of his 80th birthday. To illustrate the business address, Bakshian quotes nine speeches that used humor and anecdotes to deliver serious messages to several very different audiences. In the Education section, Bakshian shows how cartoonist Garry Trudeau hilariously defused the "political correctness" time bomb in speaking to a graduating class at Yale University. And so on.

But here's what really makes *American Speaker* stand out from the crowd of business publications. In addition to the basic 600-page volume, readers also receive timely updates, transcripts of recent, powerful speeches and a free consulting service with Bakshian, to resolve those last-minute speaking challenges. Best of all, the entire package is guaranteed. Review *American Speaker* for 30 days. If it doesn't meet your expectations, return it to Georgetown Publishing House for a complete refund.

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Trends

Smart Skis

Experienced skiers know that the shape of a ski determines in large part how well it performs in different types of snow. Wide skis ride better on deep, soft powder by spreading the skier's weight over a larger area. Hourglass-shaped skis turn better on hard packed snow and ice because they concentrate more of the skier's weight on the blade edge at the middle of the ski, allowing it to dig deeper and make sharper cuts. Shorter skis make turning on any kind of snow easier because there is less ski to redirect. And longer skis provide greater stability, and therefore allow better control at higher speeds, because more of the ski is in contact with the snow at all times.

Now ski manufacturer K2 of Vashon, Wash., has developed a radical ski that it claims performs well in all conditions. The product development team set out to design an all-mountain expert ski with good performance in hard and soft snow, according to Timothy Petrick, vice-president and general manager for K2 North America. The engineers determined that short, wide, hourglass-shaped skis would provide the greatest versatility, he says. "But the downside of short skis is that they vibrate at high speeds, which causes instability and loss of control."

The team decided to investigate so-called "smart materials" technology, which can use piezoelectric devices to detect the vibration and then function as actuators to oppose and cancel it out. Piezoelectric devices have the unique ability to detect an induced physical deformation such as a shock or vibration and convert it directly into an electric charge. (One of the more common piezoelectric sensors is the phonograph needle, which produces minute electrical currents in response to the tiny



K2's new Smart Ski automatically dampens vibration to help skiers maintain control at high speeds. Three piezoelectric elements placed in front of the ski binding detect vibrations and then quickly initiate responses that cancel them out.

bumps in record grooves.) What makes the materials suitable for dampening vibrations, however, is that they can also do the reverse—convert an electric field into an applied stress or force.

The engineering team placed a dampening unit consisting of three piezoelectric elements directly in front of the binding of the K2 Smart Ski where the largest vibrations occur. Any bending of the ski causes the elements to produce a current that drives a logic circuit in a control module that in turn induces the elements to move in opposition to the external vibrations, quickly canceling them out, says Kenneth Lazarus, president of Active Control Experts (ACX) of Cambridge, Mass.

This vibration-canceling capability boosts control on fast downhill runs and when carving quick turns on hard snow by keeping the Smart Ski on the snow, says Anthony DeRocco, director of the development team at K2. It works like a

car's suspension system, which improves control by maintaining contact between the tires and the road. As long as there is air between tire and road, no amount of steering will have any effect, he says. "The same is true of skis and snow: no contact, no control."

The K2 Smart Ski is among the first mainstream consumer products to benefit from the use of piezoelectric smart materials in what engineers call an adaptive structure—a mechanism that senses environmental changes and compensates for them by automatically altering its shape or position. But the product may be the vanguard of many more to come.

The technology got its start in classified government projects aiming for precision control of deformable mirrors and other high-resolution optics in Star Wars weapons systems. Though this space-defense work continues, the focus of many researchers has shifted to civilian spacecraft, which often suffer from structural stability problems. For example, both the Hubble Space Telescope and the Galileo Jupiter probe suffered from unwanted vibrations and sticking of mechanical parts that might have been prevented by autonomously adaptive structures.

Other potential applications for smart materials include controlling the shape of aircraft wings, canceling noise in submarines and aircraft, and suppressing vibration in helicopter rotor blades and shafts, precision machinery, air conditioning equipment, optical systems, and automobiles.

Because of the technology's promise, federal support for smart materials and adaptive structures is flourishing. Several organizations including the National Aeronautics and Space Administration, the Advanced Research Projects Agency, the Army Research Office, the Air Force, and the Office of Naval Research, are providing a total of \$40 million a year for further research and development.

—STEVEN ASHLEY

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Online in the Outback

Videoconferencing is still considered little more than a novelty in the United States and other industrialized countries. But for several isolated aborigine communities in the remote Australian outback, the technology has become the primary medium for personal and business communications. Unlike the telephone or radio, this medium effectively conveys the extensive system of hand gestures that aborigines use while speaking. And unlike broadcast television, it is interactive and therefore facilitates the extensive consultations that aborigine leaders traditionally employ in reaching ceremonial and community decisions.

Since 1993, Warlpiri aborigines in the Tanami region of Australia's Northern Territory have owned and operated a sophisticated rural videoconferencing network. The system, known as the Tanami Network, links four remote Warlpiri settlements with each other and with videoconferencing sites in the cities of Sydney, Darwin, and Alice Springs. Connections to these urban areas provide the Warlpiri with audio and video access to government service providers, other Australian aborigines, business customers for Warlpiri arts and crafts, and indigenous groups on other continents. In the popular network's first year of operation alone, community members logged some 1,200 hours in personal or ceremonial videoconferences and made numerous contacts with government agencies providing services such as adult and secondary education, teacher training, remote health care, and social security and legal assistance.

Each of the network's seven sites has a videoconferencing system designed by PictureTel of Danvers, Mass., consisting of a color television monitor, video camera, and electronic console. Because the region's telephone lines are not adequate to carry broadband videoconferencing signals, conferences are transmitted by dish components to communication satellites. The signals are then routed to high-

speed telephone lines over which the Warlpiri can hold conferences with contacts throughout the world.

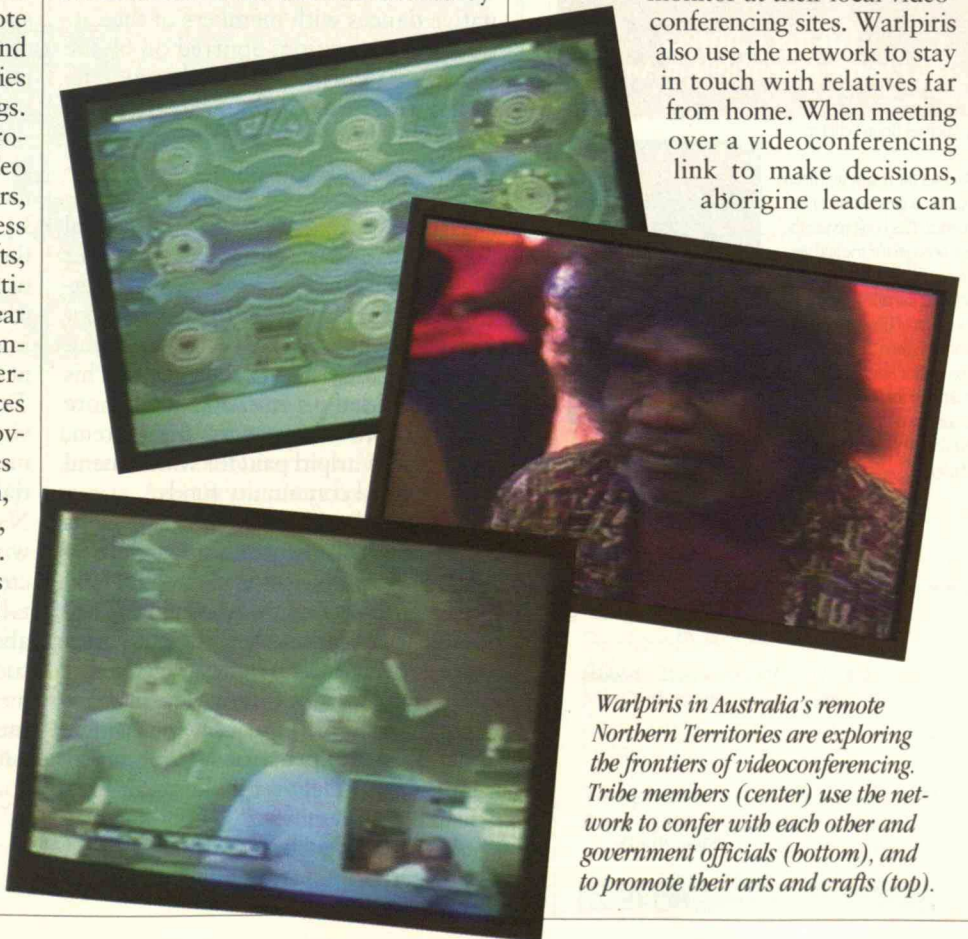
The PictureTel system can connect up to 16 participants in a single videoconference, with the capacity to link as many as 240 other conferees through a series of electronic bridges, says PictureTel spokesperson Kevin Flanagan. All the participants see and hear one person at a time, he says, with the order of speakers selected either by a human moderator or automatic voice activation.

"The Tanami Network project has shown that videoconferencing greatly improves the frequency and quality of family and community contacts for aboriginal people," says Peter Toyne, a rural telecommunications specialist and an adviser to the network. Regular communication among extended family and friends is especially important in Australian aborigine communities, where social cohesion has been threatened by

geographic isolation and the overwhelming influence of Australia's dominant Western culture.

The Warlpiris' involvement in the video medium began in the 1980s, when they helped to develop aborigine-oriented programming for a private television station in the Tanami region. In 1990, with the help of the station's technical advisers, 300 community members took part in a three-day trial demonstration of videoconferencing that linked the communities of Yuendumu and Lajamanu. The Warlpiri community later hired a consulting company to specify and install the equipment needed for the Tanami Network.

The great majority of videoconferences conducted over the network have been personal or ceremonial in nature. Families from different communities conduct regular reunions, for example, by gathering in front of the television monitor at their local videoconferencing sites. Warlpiris also use the network to stay in touch with relatives far from home. When meeting over a videoconferencing link to make decisions, aborigine leaders can



Warlpiris in Australia's remote Northern Territories are exploring the frontiers of videoconferencing. Tribe members (center) use the network to confer with each other and government officials (bottom), and to promote their arts and crafts (top).

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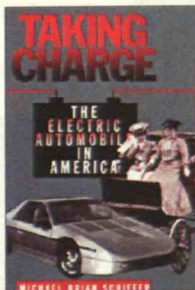
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TRENDS

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Warlpiri artists and craftsmen also are marketing and promoting their arts and crafts through the network. For example, artists in the community of Yuendumu recently used videoconferencing to discuss their work with an audience in London's Festival Hall, and later to "meet" with an academic researcher in North Carolina who is studying Warlpiri art.

Perhaps the most intriguing use of the system is a continuing series of videoconferences among the Warlpiri aborigines and indigenous groups on other continents, including the Scandinavian Saami, Alaskan Inupiat, Canadian Inuit, and the Little Red Cree nation in Alberta, Canada. These videoconferences have so far focused primarily on land rights and language preservation—two issues of deep concern among indigenous peoples worldwide. But one recent session allowed an exchange of native dances with members of the Little Red Cree nation. Spurred on by the success of this dance exchange, the Warlpiri hope to collaborate this year with other groups in a global videoconference festival of traditional and contemporary music.

Needless to say, such a powerful means of communication is costly. Over the first three years of the Tanami Network's operation, organizers have spent some \$1.5 million developing, maintaining, and administering the system. This total included an initial cost of more than \$200,000 to set up the system, which the Warlpiri paid for with mineral royalties and community funds.

Meanwhile, service providers such as the Northern Territory Correctional Services, various colleges in the region, and the Central Australian Aboriginal Legal Aid Service bear much of the network's operating costs by paying usage fees of more than \$200 per hour. The practice is cost effective because it saves providers the time and expense of sending representatives to meet with clients in such isolated communities.

Another videoconferencing network, developed through the Mungindi Project

of Australia's Northern Borders Senior Access Program, is serving aborigine students in the northern part of New South Wales state. Less expensive and powerful than the Tanami Network, this system uses videoconferencing software developed at Cornell University to link four remote schools between 200 and 400 kilometers apart, says project director David Watson, a faculty member at the University of New England in Armidale, Australia. The software, known as CU-SeeMe, transmits low-resolution, black-and-white images over the Internet (see "Videoconferencing for the Rest of Us," TR February/March 1996, page 17).

The project's purpose is to let secondary students finish their last two years of education at home rather than boarding in distant cities or dropping out of school after the tenth grade. The Mungindi Project not only brings scarce teaching resources to all four schools, says Watson, but it also gives students a chance "to explore community values on topics beyond those available in their own isolated community."

Other aborigine videoconferencing systems also in use or under development include a small network in the Kimberley region of western Australia and one in the Cape York and Gulf communities of north Queensland. The aborigines ultimately hope to create independent but interlinked regional videoconferencing networks throughout the country, says Tanami adviser Toyne. That prospect was furthered by the federal government's recent decision to provide a "partial rollout" of funds for establishing a National Remote Area Broadband Network. This initial appropriation would create videoconferencing and other digital communications services in 20 remote aborigine communities. Through projects such as these, he says, Australia's aborigines may soon offer the world an effective model for locally controlled rural telecommunications.—MARK HODGES

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Lyme Disease: A New and Novel Vaccine

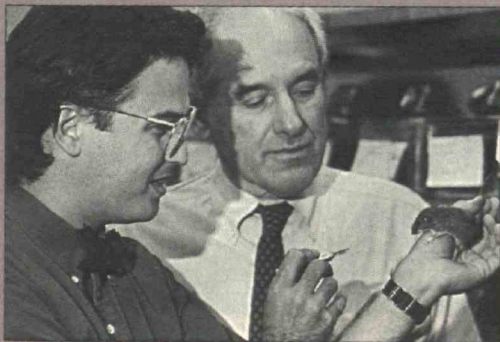
They don't usually bite in the neck, but they do want to suck your blood—a discomfiting fact that may help explain the extravagant amount of attention showered upon the dreaded deer tick, purveyor of the bacterial infection known as Lyme disease. Now there is some good news in the fight against this tiny, disease-wielding vampire. Preliminary evidence indicates that a vaccine developed at Yale University may be effective against Lyme disease. Two firms, Connaught Laboratories of Swiftwater, Pa., and pharmaceutical giant SmithKline Beecham of Great Britain, are now undertaking large-scale human trials, and each is racing to offer a federally approved vaccine as early as next year.

Lyme disease makes a good candidate

and disarm incoming disease agents, the new Lyme disease vaccine works more like a preemptive first strike. When a tick bites a vaccinated human, the blood-borne human antibodies stimulated by the vaccine are carried inside the tick where they destroy the disease-causing bacteria before they can mount an attack on the human body.

"The concept has been tried before," says Samuel Telford, an infectious-disease specialist at the Harvard School of Public Health who helped test the new Lyme disease vaccine's efficacy. "But this will be the first working vaccine to use this mode of action to protect humans."

News of a potentially effective vaccine is especially welcome in the United States because the nation's incidence of Lyme disease continues to rise. Some 11,830 cases were reported to the Centers for Disease Control (CDC) in 1994, technically insufficient to classify it as



Disease experts Samuel Telford (left) and Andrew Spielman determined that the human vaccine for Lyme disease—an illness carried from mice to people by deer ticks—works by killing bacteria in the ticks as they slowly feed on their human targets.

for a vaccine. Although it can be treated with antibiotics and normally starts with nothing more than a simple rash and flu-like symptoms, the illness is notoriously hard to diagnose, and its long-term effects can be serious, including severe arthritis and nervous-system damage. But while a vaccine against the tick-borne scourge is noteworthy in itself, this one is attracting special attention for the novel way in which it works.

Administered to humans, the new vaccine actually takes effect within the body of the biting tick. While most vaccines operate like the biological equivalent of a ballistic-missile defense system, using a person's antibodies to intercept

an epidemic, but already ranking as by far the most common disease in North America transmitted to humans by insects. And the numbers have increased steadily every year since the agency began keeping track in 1982 when 497 cases were reported.

Many doctors who treat Lyme disease, like rheumatologist Michael Spiegel, of Danbury, Conn., also point out that the true number of cases is undoubtedly far higher than official figures indicate because physicians often fail to complete the CDC's voluntary and time-consuming reporting procedure. Moreover, the agency also has "such strict criteria for defining Lyme



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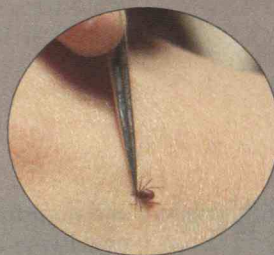
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TRENDS



The deer tick—so named because deer are the insect's meal of choice—transmit several other diseases, for which vaccines similar to that for Lyme disease might be developed.

that many patients who may have the disease are not included," he notes.

Equally important, the aggregate figures obscure the alarming incidence of Lyme disease found in some individual locales. For example, according to evidence compiled by Telford's colleague Andrew Spielman, an entomologist at Harvard's School of Public Health, three-quarters of all households along a particular road near the coastal Crane Reservation in Ipswich, Mass., include at least one member who has contracted Lyme disease.

In the past few years, vaccine researchers using genetic engineering techniques were confident they could induce immunity to the Lyme-causing bacteria. But they were not sure whether the antibodies would reach their targets. When a tick draws your blood, it does not inject bacteria back into your bloodstream, Spielman says, but rather deposits bacteria directly into your skin tissue. Thus researchers didn't think the blood-borne antibodies conferred by the Lyme-disease vaccine could reach skin tissue in sufficient quantities to protect against infection.

Researchers were bewildered, then, when the early trials on mice and hamsters worked so well. In fact, in one intriguing series of tests in which mice were inoculated and then subjected to Lyme-infected ticks, vaccine developer Erol Fikrig, a rheumatologist at Yale University, discovered at the end of the trial that not only were the mice free of the Lyme disease bacteria, the formerly infected ticks were too. Fikrig speculated that the vaccine must be so effective it was conferring immunity upon the mice and sterilizing the tick's bacteria at the same time.

But as Spielman and Telford have since determined, the key to the Lyme-disease vaccine's success stems from the fact that the slow-feeding deer ticks take about 36 hours before they can transmit the dis-

ease-causing *Borrelia burgdorferi* bacteria—a family of spirochetes that look, under the microscope, like corkscrew-shaped fusilli pasta. "Once a tick starts biting," Spielman explains, "it takes this long," for the spirochetes to work their way from the tick's mid-gut into its saliva, through which they are

deposited into human skin. The delay, or "grace period," he says, "also allows the vaccine to work in the tick before the bacteria can reach their human target."

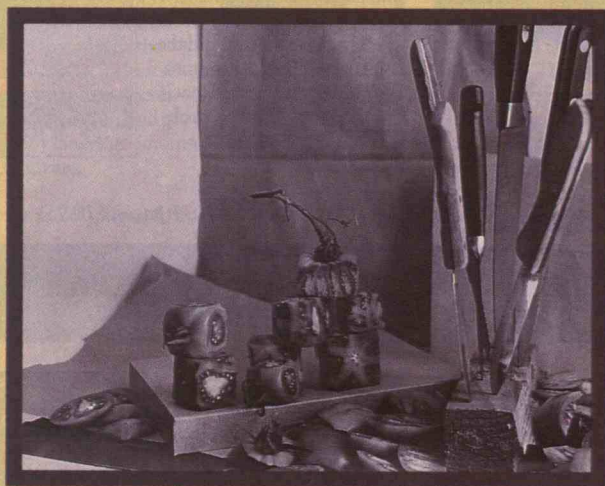
But the good news of the vaccine's effectiveness is tempered by evidence Spielman, Telford, and others have gathered that tick bites can pass to humans no fewer than three serious diseases unrelated to Lyme. These other diseases—including so-called babesiosis, a malaria-like illness with a rash and arthritic symptoms; encephalitis, which can induce seizures, paralysis and even coma; and a potentially lethal disease called human granulocytic ehrlichiosis—are all transmitted far more rarely than Lyme disease and all can be treated if properly diagnosed. But they clearly dampen enthusiasm that a Lyme disease vaccine could entirely eliminate the threat posed by tick-infested woodlands.

Interestingly, Spielman and Telford differ in their estimation of the chances that researchers might eventually be able to use a similar mode of action to develop vaccines against these other tick-borne diseases. Spielman is dubious, but Telford holds out the possibility that the technique could show promise. But both agree that, as Spielman puts it, "the Lyme disease vaccine offers an interesting model for exploring some other insect-borne diseases." Among the candidates to explore, Spielman says, are variants of the third-world killer disease called leishmaniasis, which is borne by a parasite that lives in the gut of sandflies, typhus, which is carried by lice, and the plague, which is caused by fleas.

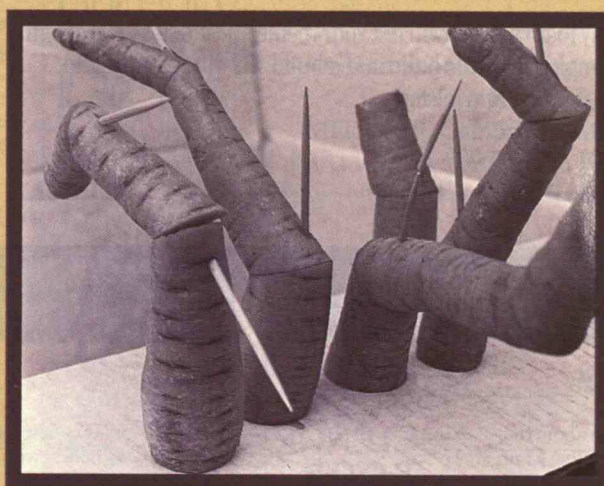
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Food for Thought

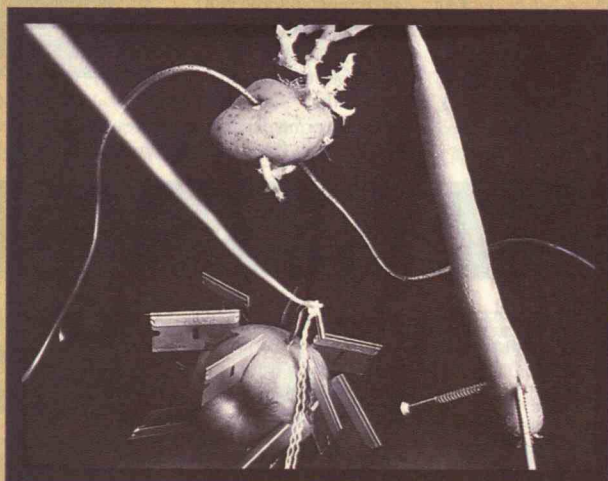
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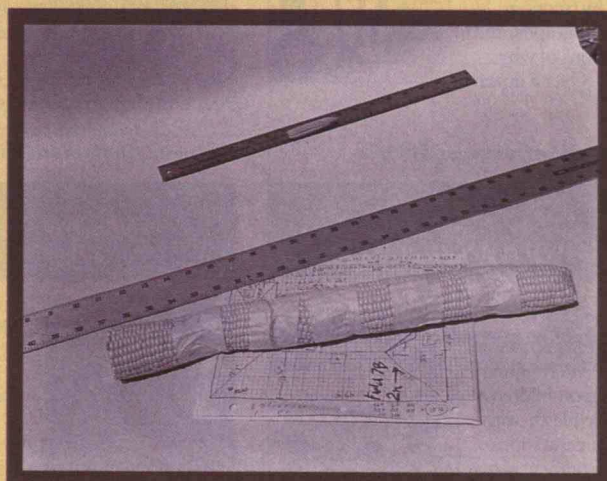
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ENGINEERED FOOD



BIG CORN, LITTLE CORN

All too often these days, the invention process can't be observed by the naked eye. How, for instance, can one see what happens as scientists alter foods through genetic engineering? When in doubt, says photographer James Soe Nyun, have some fun. That's what he has done with his images of "engineered food," which have won *Technology Review's* annual photography contest.

In his response to "In Search of Ingenuity," this past year's request for images capturing the invention process, Soe Nyun has also written that his photos serve a serious purpose. He hopes to remind people that, although they usually don't consider a head of lettuce "in the same class as a television," food has strong standing in the world of technology. Think of the agricultural process itself. Or of food that has been enriched, or of preservatives. Consider artificial flavors and sweeteners such as cyclamate and the possibility of altogether new products such as olestra, the no-calorie fat substitute approved in January by the U.S. Food and Drug Administration. "It is likely that we will soon see many more examples" of engineered food, Soe Nyun points out, "and our notions of food will be tested further." Soe Nyun used a Linhof Technika III camera with Kodak T0Max 100 film to produce these photographs.

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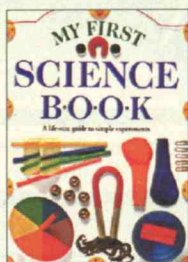


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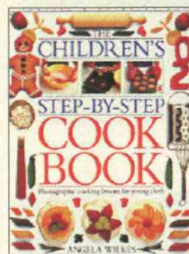


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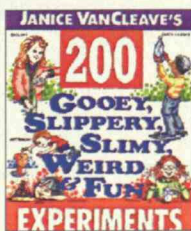


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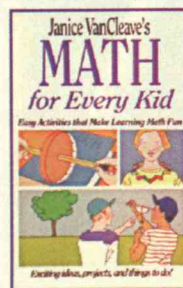


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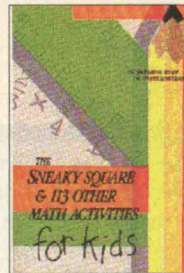


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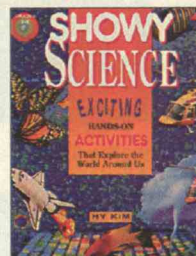
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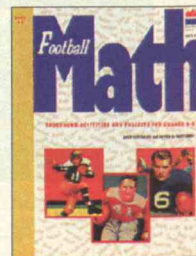
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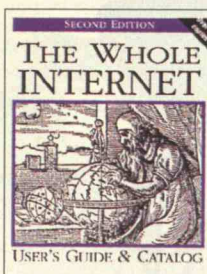
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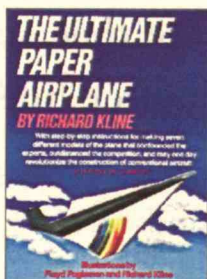
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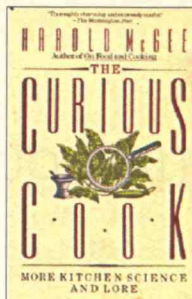
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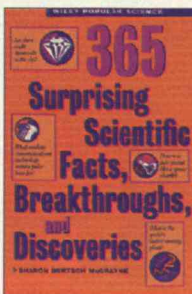
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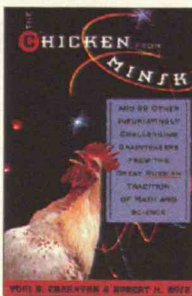
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Apocaly



Years of scientific research
have yielded no convincing evidence that
magnetic fields produced by electric power lines
cause adverse health effects.

ILLUSTRATIONS BY MAXINE BOLL-HUGHES

pse Not

BY JON PALFREMAN



WITH some 2 million miles of power lines carrying electricity from generating stations to homes and businesses across the United States, utilities go to great lengths—stringing wires on high towers, burying them underground, and fencing in substations—to avoid accidental electrocutions. But some concerned citizens, journalists, and scientists have warned for more than 15 years of a more pernicious danger emanating from power lines: electromagnetic fields. ☞ A charged particle in motion (like an electron flowing in a wire) produces an electric and magnetic field, so a person standing underneath a power line is exposed to both. While the electric field can hardly penetrate skin, much less the walls of houses, a mag-

netic field will pass through just about anything and can permeate a human body as if it were free space. Thus, a broad consensus has developed that, if the electromagnetic radiation from power lines is dangerous, the magnetic fields must be doing the damage.

This was indeed the hypothesis of Nancy Wertheimer and Ed Leeper in 1979 when they published the first epidemiological study linking electromagnetic fields to childhood cancers. Wertheimer, a psychologist who now works with the Department of Preventive Medicine at the University of Colorado, and Leeper, a retired physicist, compiled a list of 344 children in the Denver area who had died of any form of cancer from 1950 through 1973 and compared them with children without cancer randomly selected from birth records. To estimate exposure to magnetic fields, they ranked the children's homes as a function of their distance from a substation or power line and the configuration and thickness of the wires near them. The results showed that, at the homes ranking highest—that is, likely to be immersed in the strongest magnetic fields—children died of cancer at about three times the rate of those residing in homes that ranked the lowest.

Since Wertheimer and Leeper's study, scientists have conducted some four dozen other epidemiological studies investigating these effects. About two-thirds have been occupational studies of workers such as cable splicers whose job potentially exposes them to strong magnetic fields. The rest are residential studies, investigating whether people living near power lines or substations face increased risk. Many of the scientists participating in these studies have claimed to find positive correlations between estimates of magnetic-field exposure and disease.

The popular media have also carried reports of clusters of cancers and other diseases allegedly caused by power lines and substations. In widely read articles in the *New Yorker*, for instance, environmental journalist Paul Brodeur wrote about a high incidence of cancers among the residents of Meadow Street in Guilford, Conn., who lived near a substation, and about an elementary school in Fresno, Calif., also located near a substation, where 15 teachers and staff members had developed cancer.

These cancer clusters and their alleged association with substations and power lines hit home: many people reading such accounts identified with the citizens and wondered about the power lines on their streets. With so much smoke, they concluded, there must be a fire. Something must be going on. Yet these numerous studies have failed to satisfy any of the

basic criteria, established in 1965 by the British epidemiologist Sir Austin Bradford Hill, for convincingly demonstrating cause and effect.

BIOLOGICAL IMPLAUSIBILITY

Among other things, the so-called Hill criteria declared that any proposed association between an environmental agent and disease should have a biologically plausible link. While acknowledging that this criterion is limited by the "biological knowledge of the day," Hill maintained that researchers must try to offer a reasonable



hypothesis of how a proposed health effect could occur.

Given what we already know about the interaction of electromagnetic fields with living tissue, it seems unlikely that magnetic fields from power lines could cause cancer or other diseases. "There's probably nothing on earth, or in the universe, that we understand as well as electromagnetic fields and the interaction of electromagnetic fields with matter, including biological matter," says Robert Adair, a physicist at Yale. These interactions, he says, make up "all of chemistry and almost all of biology, excepting a few gravitational effects."

Adair is one of a growing group of physicists who have felt compelled to participate in the electromagnetic field debate. A few years ago, Adair and his Yale colleague physicist William Bennett found that the more they studied the area, the more skeptical they became. What makes the connection seem most improbable to Bennett is what he calls the "absolutely minuscule" strength of the magnetic fields in question.

JON PALFREMAN is an award-winning senior producer at WGBH, Boston's public television station, where he specializes in issues at the intersection of medicine and politics. This article is based in part on material he and his colleagues gathered for the Frontline program "Currents of Fear."

Magnetic fields are measured in milligauss (thousandths of a gauss). The fields recorded in most homes, even ones near power lines, are of the order of a few milligauss at most. Even standing directly under most power lines, one is typically exposed to only 50 milligauss or less. Yet, as every school child knows, we live in the earth's magnetic field. This field in North America averages about 500 milligauss.

While this fact alone makes it sound as though electromagnetic fields from power lines would certainly be lost against this magnetic backdrop, the earth's magnetic field is relatively static. The magnetic field associated with power lines, on the other hand, is normally so-called alternating current (AC), vibrating to and fro some 60 times per second. Some people argue this is the critical difference. As Brodeur puts it, "When you're standing underneath the power lines, every cell in your brain and body is entrained to the rhythm."

But according to Adair, despite the image of every cell in one's body moving back and forth 60 times a second, the effect is minuscule compared with temperature-induced oscillations that occur all the time—an effect with a magnitude thousands of times larger. "It's completely lost in the noise,"

Adair says. "The fact that we live at 98 degrees Fahrenheit means everything is always oscillating, bouncing back and forth because of thermal effects." Comparing the cell vibrations caused by power lines' electromagnetic fields to those caused by temperature fluctuations, Adair likens them to damage your cat might do to a tree by breathing on it in the middle of a windstorm.

Since the field is so weak, Bennett and Adair, like many other scientists, find it hard to see how it might cause cancer. Cancer is usually caused when very energetic radiation, or some chemical agent, directly breaks or rearranges DNA. But the forces holding DNA molecules together are millions of times larger than any force that electromagnetic fields from power lines could produce.

Participants on both sides of the debate generally agree that the electromagnetic fields emanating from power lines and electrical appliances do not have enough energy to initiate cancer. But some critics argue

that electromagnetic fields from power lines might promote an existing cancer or perhaps affect the immune system in a novel way. Some proponents of this view, for example, argue there might be mechanisms in the human body capable of amplifying the signal so it can be heard above the background thermal noise. Such "hardware" has been discovered in sharks that can detect 60 Hz magnetic fields, but not yet in humans. Other scientists, like A.R. Liboff, a physicist at Michigan-based Oakland University, argue that there might be a resonant "window" effect whereby human cells are especially responsive to a frequency range that includes 60 Hz. To account for the power systems in Europe, where some epidemiological findings have come from, however, this window must necessarily include 50 Hz as well.

Bennett and Adair, together with the overwhelming majority of physicists, dismiss these theories outright. The 45,000-member American Physical Society, for instance, released a report on electromagnetic fields last May arguing that cancer fears were unfounded and lending little credence to the resonance hypotheses. But, as Hill stressed, biological plausibility is merely one of several factors that can establish a link between an environmental agent and disease. By itself, the lack of a plausible electromagnetic field-disease hypothesis is not enough to sink the possibility of a connection.

BULLET-PROOF STUDIES

According to the Hill criteria, researchers can also reveal a link between environmental factors and disease by using controlled procedures in the laboratory. For instance, it is widely agreed that exposure to AC electromagnetic fields in excess of 2,000 gauss—millions of times larger than those implicated in the epidemiological studies—can excite nerves. But early research suggesting that AC magnetic fields could adversely affect the development of chick embryos has not been borne out in subsequent studies and, in general, experiments reporting effects at fields lower than about 5 gauss have not been replicated.

Three years ago, a \$65 million federal program operating under the auspices of the National Institute of Environmental Health Sciences began sponsoring a series of carefully designed laboratory studies, funding multiple versions of all the research to increase the likelihood that any findings would be independently replicated. As a key piece of this program, the Illinois Institute of Technology constructed, deep under the streets of Chicago, the world's largest facility designed to expose rodents to electromagnetic fields. Built almost entirely of nonmetallic materials (so not to interfere with the magnetic fields) and containing state-of-the-art monitoring equipment, the \$9 million facility is capable of exposing 3,000 rodents at a time to measured doses of magnetic fields ranging from 20 milli-

Many people
inferred from
media accounts
of the controversy
that with so much
smoke, there
must be fire.

gauss to 10,000 milligauss—thousands of times the average exposure in most homes. Project leader David McCormick says he wanted a facility capable of producing “bullet-proof studies.” And indeed, it appears everything imaginable has been controlled for: the earth’s magnetic field in all the rooms has been mapped extensively; temperature, humidity, noise, and light levels are all controlled and monitored continuously lest they confound the results; and every year the National Institute of Standards and Technology checks the lab equipment’s calibration.

By last spring, McCormick’s group had completed five studies. In one, involving a total of 3,000 rodents, the team investigated whether magnetic fields such as those from power lines caused fetal abnormalities. Pathologists examined the animals’ skeletons, heads, and visceral organs. According to McCormick, the results came up completely negative. “We found no adverse effects from the magnetic fields at all,” he says.

The group also conducted a reproductive study in which they bred animals continuously exposed to magnetic fields. McCormick’s team examined 12 sets of litters over three generations and looked at a variety of outcomes: the number of successful pregnancies, the number of litters delivered, the number of pups per litter, and several other parameters such as birth weight to assess the health of the pups once they were delivered. Again, as McCormick explains, “That study demonstrated no effects of the magnetic fields on reproductive performance in either sex.”

To test the hypothesis that magnetic fields could promote an existing cancer, McCormick used two strains of transgenic mice genetically engineered to predispose them to lymphomas. McCormick exposed the transgenic mice to measured intensities of magnetic fields and compared them with an unexposed control group. The result was unambiguous—no evidence appeared that the magnetic fields had stimulated the development of lymphoma in either strain of mice. Similarly, McCormick’s team was unable to demonstrate that electromagnetic fields caused any consistent effect on the animals’ immune systems.

McCormick’s laboratory is still conducting a study in which rats will spend two years—essentially their whole lives—exposed to a magnetic field to test for chronic long-term effects. The results won’t be known until later this year.

Proponents of the electromagnetic field-disease hypothesis rightly argue that one should not rely on McCormick’s results until they are replicated. Such studies are under way in the United States, Canada, and Scandinavia. But the thrust of the most recent—and most thorough—experimental evidence is unmistakable. McCormick’s work is just the latest of a series of whole-animal studies that have failed to find any health effects from electromagnetic fields.

But whole-animal experiments, such as those under-

taken by McCormick’s group, are just one approach to unlocking the mysteries of magnetic fields. One provocative possibility, also the target of federal research funding, is that exposure to magnetic fields might somehow affect the cancer-causing genes called oncogenes. Research by Reba Goodman and Ann Henderson, molecular biologists at New York’s Columbia University and Hunter College, respectively, had claimed just this: that the fields might be capable of stimulating a particular cancer gene known as the MYC oncogene, increasing its activity and perhaps its likelihood of causing cancer.

Two groups—one at Cambridge University in Eng-

No one
has found a
biologically
plausible link
between electro-
magnetic fields
and cancer.



land and one at the Battelle Pacific Northwest Laboratories (PNL) in Washington—were intrigued enough to try to replicate these results. In his attempts, Jeffrey Saffer, a molecular biologist at PNL, controlled for factors such as temperature, humidity, noise, and vibrations by placing batches of human cells into two identical test chambers. Then, in each trial, he randomly assigned one chamber to receive exposure from 60 Hz magnetic fields. Next he analyzed the samples to see if there were any differences. The whole procedure was conducted blind to eliminate potential investigator bias.

When Saffer’s first results failed to detect any effect, he repeated the experiment dozens of times, changing parameters such as field intensities, serum types and concentrations, and the type of cell culture. But despite these efforts, nothing worked. Finally, Saffer took an unusual step; he went to the laboratory of Reba Goodman and repeated the experiment using her cells, culture vessels, and exposure system. His result was the same. As Saffer puts it, “We were unable to find evidence for

a change in MYC expression due to the magnetic field.”

Saffer concluded that the effects reported by Henderson and Goodman probably resulted from inadequate experimental controls. (A full account of Saffer's work appeared in the October 1995 edition of the journal *Radiation Research* along with a report from the team in Cambridge, England, that also tried—and failed—to replicate the effect.)

Although other studies here and abroad have reported negative results as well, some critics argue that electromagnetic fields might affect human beings in ways that these experiments are failing to pick up. Public policy, they further

argue, should not be determined in the laboratory but rather with reference to the many epidemiological studies investigating the link between 60-Hz magnetic fields and disease in humans.

STRENGTH, CONSISTENCY, AND SPECIFICITY

According to the Hill criteria, epidemiology alone can establish a causal connection even in the absence of biological plausibility or laboratory evidence, provided any association possesses the qualities of strength, consistency, and specificity.

A notable case of strength occurred, for instance, when workers exposed to vinyl chloride were found to contract a rare form of liver cancer at a rate some 200 times normal. Another clear modern example is the link between smoking and lung cancer. In his work with the epidemiologist Sir Richard Doll, Hill found that a person who smokes a pack of cigarettes per day is 14 times more likely to develop lung cancer than a nonsmoker. Moreover, Doll and Hill found that this number—the so-called risk ratio—increased as the dose grew. Smokers who consumed two packs a day, for instance, faced a significantly greater risk. This effect—a so-called dose-response in which more is worse—Hill argued, was also strong evidence of causality.

In the extensive search for a connection between electromagnetic fields and adverse health effects, though, even those studies that have found a link have risk ratios that hover between 1 and 2. Such low ratios might signal a real effect yet to be isolated, but they might also simply reveal statistical noise. Despite some 15 years of

research on this topic, both possibilities “still remain viable,” according to David Savitz, an epidemiologist at the University of North Carolina.

Traditionally, evidence of an effect increases as scientific studies improve, but that doesn't seem to have happened in this area. Some of the most recent and sophisticated studies, such as two large-scale investigations of pregnant women who use electric blankets, another source of exposure to electromagnetic fields that has caused concern, have yielded negative results.

But because no single study can be relied on as definitive, Hill wisely noted that consistency can help establish an epidemiological link. In the case of smoking, for example, hundreds of studies have reproduced what Doll and Hill found for lung cancer, revealing risk ratios in the range of 10 to 30.

Proponents of the hypothesis that electromagnetic fields cause cancer acknowledge the lack of strength in the association but argue that an unmistakable trend exists. As David Carpenter, dean of the School of Public Health at the State University of New York (SUNY) at Albany, puts it, “while I admit that the proof is not 100 percent, there is consistency in correlation between leukemia and brain tumors and exposure to magnetic fields both in residential and occupational settings.”

But is there really a consistent trend? In the past few years, several very large occupational studies have been published attempting to link electromagnetic-field exposure to disease. One 1994 study of Canadian workers, led by Gilles Theriault at McGill University, found a small association with leukemia but no link with brain cancer. Another study by David Savitz and colleagues at the University of North Carolina found no link with leukemia but a small association with brain cancer. Research by Jack Sahl at the UCLA School of Public Health in 1993 found nothing at all. The picture is also inconsistent for specific diseases like childhood leukemia. Savitz found a weak association, but other researchers, such as M.P. Coleman at the International Agency for Research on Cancer, did not. An earlier study in 1986 by L. Tomenius, former medical officer for the county of Stockholm, Sweden, even found an inverse correlation (implying electromagnetic fields offer protection against leukemia).

In fact, these study findings aren't just inconsistent, they also lack specificity. In his criteria, Hill emphasizes that actual epidemiological links must be specific: a particular kind of disease associated with a particular exposure offers a strong argument in favor of causation. Less compelling, on the other hand, are findings claiming that a whole range of diseases are linked to a diverse set of exposures. Judged in this light, the studies of electromagnetic fields and health effects have revealed few such specific links. Childhood leukemia and adult brain cancer have been implicated in several studies while others cite weak evidence for a range of ailments including adult leukemia, eye cancer, central ner-



vous system tumors, neuroblastomas, meningiomas, lung cancer, male breast cancer, female breast cancer, Alzheimer's, and Parkinson's disease.

So what about the reported "clusters" of disease that are purported to be related to exposure to electromagnetic fields? One thing virtually all epidemiologists agree on is that, while clusters of disease may point to fruitful topics of study, their existence alone is not scientifically valid as a method to prove a connection between an environmental agent and disease. Epidemiologists like to tell their students the cautionary tale of the Texas sharpshooter, who fires bullets at the side of a barn and then draws in the target afterward to maximize his number of bulls' eyes. The point of the analogy is that diseases like cancers occur randomly in the population. Arbitrarily drawing boundaries in space and time by counting up the numbers of cancers in a given zip code, street, or school over a period of time is rather like the Texas sharpshooter; such arbitrary selection makes chance variations look like meaningful clusters. Just by chance some zip codes will have more than the average number of cancers. Just by chance, others will have fewer.

The problem is especially acute when the number of cases involved is small, as with rare cancers. In the case of Meadow Street, which is 250 yards long and contains only nine houses, journalist Paul Brodeur revealed that over several decades the residents suffered two malignant brain tumors and a nonmalignant brain tumor. The implication was that these were related in some way to the substation across the street. In fact, epidemiologists in Connecticut have argued persuasively that this number of brain cancers was not out of the ordinary. Even SUNY epidemiologist David Carpenter, who is convinced of a connection between electromagnetic fields and cancer, does not base his conviction on cluster studies, noting that "by statistics alone, it's very possible that there will be a number of cancers in one block and none in the next ten blocks."

To get around the problem of chance variation, epidemiologists typically study large numbers of individuals exposed to a candidate carcinogen or toxin and compare them with an equally large control group not exposed (or exposed to a much lower dose). By using large numbers of cases they can minimize the possibility that any differences between the groups could have appeared merely by chance.

Achieving statistical power is just the first problem,

though. Epidemiologists must also eliminate confounders—other factors that might skew the results, such as the age, sex, and socioeconomic status of the study populations. Some diseases affect old people more frequently than young people, or women more than men, or poor people more than rich people. It is possi-



ble, for example, that people who live in houses near power lines are not as affluent or as well-educated as people who live away from them. If this is true, it might well account for any differences in health observed.

Investigators also have to rule out other potential environmental confounders ranging from traffic density to toxins. PCBs were widely used in electrical transformers, for example, and herbicides are sometimes used to clear tracts of land for power lines. Should a correlation be found between power lines and health effects, it would be essential to rule out these potential sources of disease.

Finally, when assessing exposure, investigators ideally ought not to know whether the person or household is a member of the exposed group or a control. Wertheimer and Leeper, for instance, did know which individuals had died of cancer at the time they were classifying houses according to wire codes, and that knowledge could have introduced bias. For this reason alone, many scientists discount their first study.

THE MULTIPLE COMPARISONS FALLACY

A 1992 study by epidemiologists Maria Feychting and Anders Ahlbom at the Karolinska Institute in Stockholm initially seemed to overcome most of these general obstacles and one major specific one: namely, that researchers investigating exposure to electromagnetic

fields have had great difficulty agreeing how best to measure such exposure. In some cases, for instance, they have settled for crude, surrogate measures like job titles that include the word "electrical." Other times they have employed on-site measurements of field strengths. Ideally, of course, researchers would like to

Epidemiological
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tromagnetic fields
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know an individual's true exposure to electromagnetic fields at the time disease allegedly started but, because this may have happened far in the past, it is normally deemed impossible.

In Scandinavia, however, electric utilities maintain complete historical records of the amount of electricity actually pulsing through particular power lines at any given time. Using a computer program, the Swedish power company Vattenfalls actually used such data about current flowing in its high-voltage transmission lines in past years to calculate the magnetic field at given distances from the wire.

Seizing this opportunity, Feychting and Ahlbom undertook to study everyone with cancer who had lived within 300 meters of Sweden's high-voltage transmission line system over a 25-year period, calculating the actual magnetic fields that children and adults were exposed to at the time of their cancer diagnosis and before. The calculation did not include exposure from local distribution lines, domestic appliances, the wires in the houses, or from sources outside the home (such as trains, underground cables, or office appliances), but it did go far enough to capture a significant part of the subjects' historic exposure to electromagnetic fields. The study also took great pains to avoid confounding variables and sources of bias.

The results, published to worldwide attention in 1992, reported an apparently clear association between magnetic field exposure and childhood leukemia, with a risk ratio of nearly four for the highest exposed group. Surely, here was proof that even physicists and biological naysayers would have to accept. In the aftermath, the Swedish government announced it was investigating whether to move children away from schools near power lines.

But some four years after the Swedish research was

published, it serves as a case study of what scientists call the multiple comparisons fallacy. A basic axiom of experimental sciences is that you must specify, in advance, the hypothesis that you are testing. But observational epidemiology sometimes mixes up two distinct kinds of experiments: those designed to generate hypotheses and those designed to test them.

Why does it matter? The answer can be found in the original contractor's report of the Feychting and Ahlbom study. Unlike the final published paper, which gives only a summary of their methods, this remarkable document reveals the comprehensiveness with which they attacked the problem. The study looked at twelve separate cancer rates (four in children and eight in adults), and used three different exposure scales (measured fields using gauss meters, calculated historic fields using the Vattenfalls' records, and measured distances from lines). Within each exposure scale there were further subdefinitions (such as cut-off points for "unexposed," "exposed," "more exposed," and "most exposed").

This initial report generated some 800 separate risk ratios, comparing the incidence of the twelve cancer rates with an astounding number of separate environmental categories—including many hair-splitting distinctions. For example, special categories were made for children who lived in single-family homes versus those who lived in apartments.

Such a method sounds thorough but, because there is no clearly stated hypothesis, we don't know which among these hundreds of comparisons the authors are testing. Unfortunately, by considering all of them, the researchers introduce a great deal of statistical noise. "By the standard way we do statistics, even if nothing is going on, we would expect 5 percent of those 800 to be statistically elevated, and 5 percent to be statistically decreased," explains John Moulder, a radiation biologist at the Medical College of Wisconsin. In other words, random statistical variation would predict some 30 or 40 elevated risk ratios above 1 (implying that electromagnetic fields cause a particular disease) and 30 or 40 decreased ones below 1, (implying that electromagnetic fields protect against that disease). Given such statistical variation, then, it becomes hard to know whether, by one measure of exposure, a finding that leukemia is up in a group of children is real or is merely the result of random noise.

Similarly, if there were no relationship between power lines and cancer, some "significantly" decreased rates of cancer would still be expected. In fact, such examples can be found in the report. Presented in isolation as evidence that electromagnetic fields "protected" against leukemia, these could be just as misleading as presenting the ones with positive risk ratios. In this regard, though, it appears that Feychting and Ahlbom were rather selective in their reporting.

For example, in the contractor's report, the



Continued
research on this
issue makes little
sense when so
many urgent
medical problems
need attention.

researchers compare leukemia rates with calculated magnetic fields at the time of diagnosis, one year before diagnosis, five years before diagnosis, and ten years before diagnosis. They find a statistically significant correlation with calculated fields at the time of diagnosis, but not at one, five or ten years before diagnosis. The authors select only the first for publication, but on what justification? Since cancers generally take several years before they show clinical signs, a correlation between electromagnetic field exposure at the time of a cancer diagnosis should be no more significant than at one year, five years, or even 10 years before diagnosis.

Seen in this context, the published associations look far less compelling. Equally mystifying, while Feychting and Ahlbom reported a "significant correlation" between leukemia and some calculated electromagnetic fields, the authors found no association with magnetic fields they actually measured. In fact, they reported an inverse relationship with measured fields (that is, it appeared that there was less childhood leukemia in homes where they measured large fields). Moreover, they failed to find any positive association with calculated fields for children who lived in apartments, only for those in single-family homes.

Two other Scandinavian studies published in 1993 that made use of calculated historic electromagnetic fields reported inconclusive results. A Danish study by Jorgen Olsen at the Danish Cancer Control Agency found no significant increase for leukemia or brain can-

cer or for overall childhood cancers when 2.5 milligauss was used as the cut-off point to define exposure (as specified in the study design). However, after reanalyzing the data, the researchers determined that the overall incidence of childhood cancer was significantly elevated if 4 milligauss was used as the cut-off point. Meanwhile, though, a Finnish study led by Pia Verkasalo at the University of Helsinki found no significant increase in the incidence of a range of childhood cancers.

It is unclear how many epidemiological studies investigating electromagnetic fields commit the multiple comparisons fallacy or how many of the seemingly positive correlations found can be explained this way. Original contractors' reports are not always available. Yet the issue is fundamental. Outside of epidemiology, most scientists are unanimous: you cannot confuse a study that tests a hypothesis with one that merely generates them.

FAILING THE TEST

It is important to note that not all the Hill criteria need to be satisfied to establish causality. As Wisconsin's Moulder explains, in some cases "the epidemiology has been so strong that we've concluded something was a carcinogen without any laboratory evidence or any mechanisms. There are other cases when we've decided that something was a carcinogen just based on laboratory data without any actual epidemiological

data.” But, as he underscores, “you need some real strengths somewhere.”

After scores of studies that span more than a decade, though, the contention that electromagnetic fields cause adverse health effects so far fails to meet any of the Hill criteria. The theory lacks biological plausibility. The experimental evidence so far is strongly negative. The epidemiological evidence is weak, inconsistent, and nonspecific. And the epidemiology is plagued by problems such as possible bias, lack of clearly defined measures of exposure, and multiple comparison artifacts.

Even if we suppose that magnetic fields from power lines do cause cancer, the fact that the connection has been so hard to prove means that, by definition, the risk cannot be large. As a worst case, for instance, assuming that Feychting and Ahlbom’s conclusions are correct, a Swedish child would face an increased risk of contracting leukemia on the order of one in a million.

The public would certainly be within its rights to want to know about such a risk but would be hard-pressed to know what to do about it. Would moving the Swedish children to another location make them safer? “Absolutely not,” says Peter Valberg, a biophysicist and risk analyst with Harvard School of Public Health. “The idea that you would bus the children as far as one mile would not make any sense in terms of the compa-

rable risks. We know from real actuarial statistics that being on a bus does carry some real health hazards in terms of injury and death,” Valberg says. And in fact Swedish authorities now agree—they decided not to make any policy changes based on the 1992 study.

In the United States, as President Clinton anticipates a long-awaited Environmental Protection Agency (EPA) report on electromagnetic fields, he faces a delicate policy dilemma. If he dismisses public concerns as unfounded, he might appear unsympathetic to people convinced that electromagnetic fields caused their health problems. On the other hand, he cannot support a position that is scientifically untenable. Unfortunately, even after the EPA report is released, Clinton’s easiest option is to continue to say that more study is needed and allocate the research funds, either to the EPA or to another program administered by an agency like the National Institutes of Health.

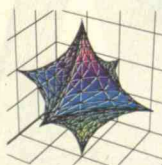
The trouble with that course is that it makes little sense to continue researching this issue when so many urgent medical problems need attention. A policy of “keep on studying” not only focuses citizens’ fears on phantom risks rather than on real ones like smoking, driving, or toxic chemical exposure, but it also drains considerable sums of money from mainstream medical research into a scientific backwater. ■

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* Wester, M., *Computer Algebra Netherlands*, Dec. 1994. Or see ftp.math.unm.edu/pub/cas/Paper.ps. Scores of ± 1 , 0 mean correct / incorrect and no answer.



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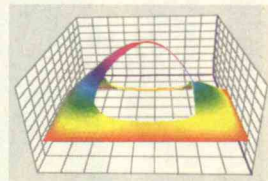
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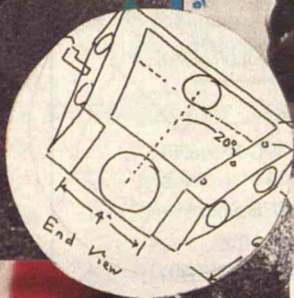
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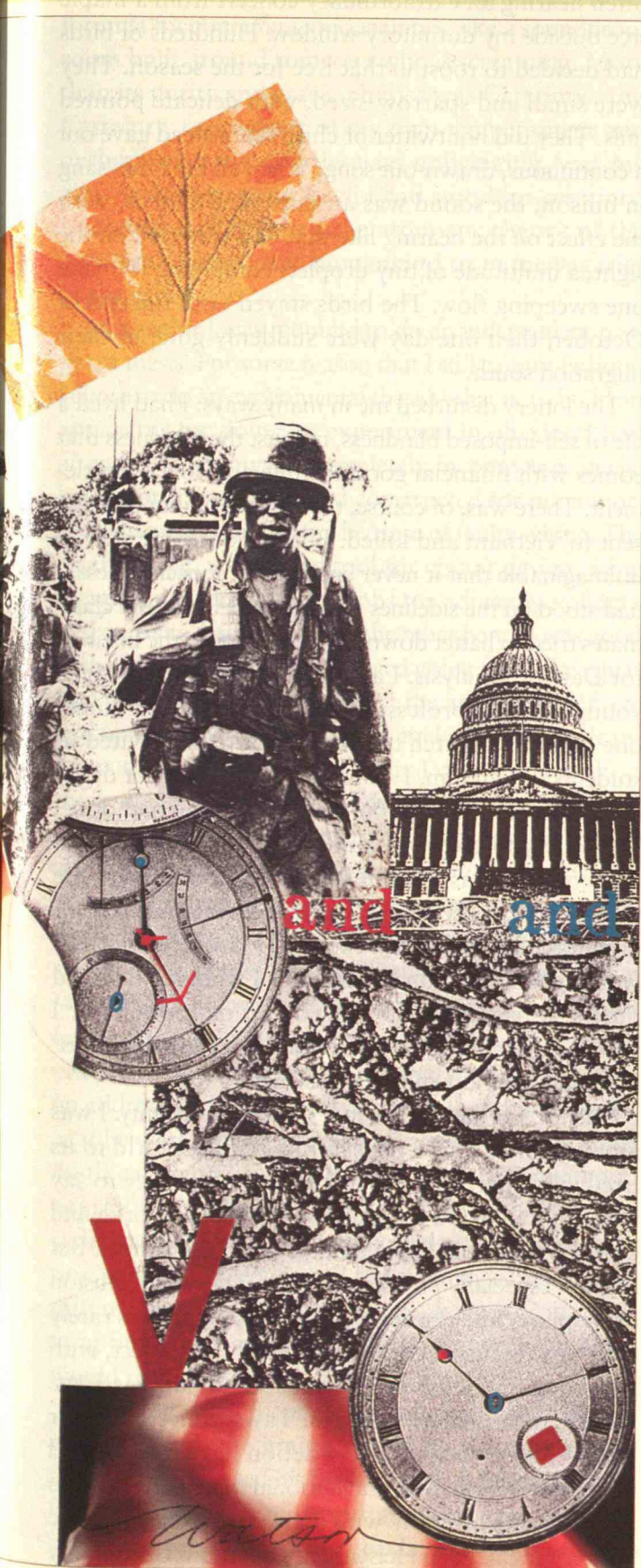
UNCERTAINTY PRINCIPLE

BY ALAN LIGHTMAN

A college student's illusion of predictability and simplicity comes to an end, both in science and in life.

IN THE FALL of 1969 there were 500,000 American troops in Vietnam. The death of Ho Chi Minh caused only a brief interruption in the 15-year-old war. And I, beginning my senior year in college, was faced with the first real challenge to a life of privilege and ease. I was thrown into the national lottery for the draft. It was the first selective service lottery in the United States since 1942. World War II, of course, had been a "popular" war. My father had been constantly afraid of dying on the beaches of Italy or Sicily but he had not hesitated to enlist when he came of age, nor had any of his friends.

ILLUSTRATIONS BY KAREN WATSON





MY FRIENDS, by contrast, did everything possible to escape military service. They were usually successful. Many got educational deferments simply for being in college. Louis, a quiet boy with a brooding intelligence, had dressed up as a Cherokee Indian for his physical examination, including war paint and feathers, and received a psychiatric release.

Others moved to Canada and were sent money from home. But the new lottery seemed a great equalizer of classes and backgrounds. Everyone faced the same odds. Each birth date was to be assigned a number by a toss of the dice. Local draft boards would begin drafting at number one and work their way upward.

The drawing occurred on December 1, at 8 p.m. Eastern Standard Time. Only the day before, on a Sunday, I had returned from Thanksgiving vacation and a grand dinner with my parents and brothers and cousins. After dinner, my mother, determined to be gay, placed a bossa nova album on the record player and made all of us dance with her barefoot in the living room. Now, a few evenings later, I sat anxiously with my roommates in our comfortable Ivy League dormitory room, listening to the radio. The scent of marijuana hung in the air. I imagined millions of other young men, short-order cooks in hamburger joints and gas station attendants trying to close for the night and other students in their rooms, all listening to their radios. Three hundred and sixty-six capsules were plucked from a cylindrical glass bowl in a government room in Washington D.C. The first birth-day chosen was September 14. I didn't know anyone born on that day, but I felt sorry for the poor devils. My birth date was chosen 280 draws later. I was never called. About a quarter of my classmates ended up in some kind of military service, that year or later.

Oddly, I remember that fall as intensely beautiful. Autumn had never been a particularly engaging season in Tennessee, where I had grown up, but here, up along the East Coast, the air was so clear and transparent that you felt you might see to the curve of the earth. I recall

often hearing an extraordinary concert from a maple tree outside my dormitory window. Hundreds of birds had decided to roost in that tree for the season. They were small and sparrow-sized, with delicate pointed tails. They did not twitter or chirp but instead gave out a continuous, drawn-out song. When all the birds sang in unison, the sound was an unbroken chorus, with the effect on the hearing like that of a waterfall on the sight, a multitude of tiny droplets combining to make one sweeping flow. The birds stayed until the end of October, then one day were suddenly gone in their migration south.

The lottery disturbed me in many ways. I had lived a life of self-imposed blindness, not just the blindness that comes with financial good fortune and social entitlement. There was, of course, the real possibility of being sent to Vietnam and killed. But this outcome was so unimaginable that it never entered my consciousness. I had stood on the sidelines in naive disbelief as my classmates tried to batter down the front door to the Institute for Defense Analysis. I avoided the bonfires. When a young assistant professor sitting next to me at dinner one night lit a match to his draft card and invited us students to join him, I admired his boldness but didn't have a shred of understanding of what he had done. The lottery forced a vast, unwanted world on me, and the sensation was a painful gush of blood through the veins. Particularly distressing was the element of randomness, the uncertainty. I wanted to make decisions. I would go on to graduate school or I wouldn't. I would pursue a particular young woman or I wouldn't. I would leave my bicycle out in the courtyard at night or I would haul it down to the basement.

Science, for me, had been a source of certainty. I was a physics major, and physics reduced the world to its irreducible particles and forces. It is a banality to say that science holds a reductionist view of the world, and even a 21-year-old knew that life wasn't so simple. But science, especially physics, provides a powerful illusion of simplicity and certainty. Textbooks on physics rarely offer any discussion of the history of the subject, with its wrong turns and prejudices and human passions. Instead, there are Laws. And the Laws seduce with their beauty and precision. Every action has an equal and opposite reaction. The gravitational force between two masses varies inversely with the square of the distance between them. Even Heisenberg's quantum Uncertainty Principle, which proclaimed that the future cannot be

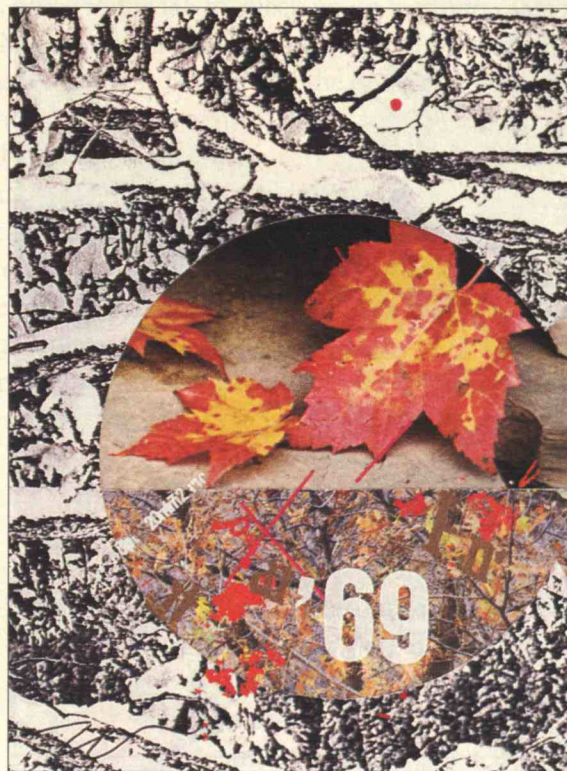
ALAN LIGHTMAN is head of the Program in Writing and Humanistic Studies at MIT. This piece is excerpted from his new collection of essays *Dance for Two*. Lightman's last two books are the novels *Good Benito* (1995) and *Einstein's Dreams* (1993). All three were published by Pantheon Books.

determined from the past, gave a definite mathematical formula for containing uncertainties, like a soundproof room built around someone who is screaming. More than its purity and grace, physics was Certainty. And Certainty, for reasons of my own temperament and perhaps also my middle-class upbringing, was my ally. Archimedes and Euclid had stood for certainty. Lucretius had invoked the atomistic theory of the world in order to free humankind from the vagaries of the gods.

As a senior I was required to do an independent project, a thesis. For some reason that I still cannot fathom, I chose to do an experimental thesis—that is, to build an apparatus for doing an experiment in physics. I had already shown myself completely incompetent in the laboratory. A gadget I had constructed for my junior-year lab project caught fire because of faulty wiring. The oscilloscope, a standard tool for circuit design, a big metal box covered with knobs for adjusting voltages and currents, baffled me. On the other hand, I was good at theoretical calculations. I loved going from one equation to the next until arriving at the answer, as definite and unassailable as the area of a circle. I loved the cleanliness of pencils and paper. Why I didn't undertake a thesis in theoretical physics I do not know.

Perhaps it was my choice of thesis adviser, Professor Turgot. There was something about Professor Turgot that I found immensely appealing. He was a big, bear-like man, fortyish, beginning to bald, stoop-shouldered, whose shirt tails always drooped down behind him. He was not at all the absent-minded professor. He could fix me and all I was thinking with one eagle glance. When he lectured in the classroom, he addressed the blackboard rather than his students, as if he were having a private conversation with some mythical being living in the world he had created in equations and diagrams. I knew that this lecturing style was deficient, but it conveyed a lifelong fascination with his subject. I wondered whether I could contain my own passion for science, keep it from thinning out and dispersing for 20 more years, when I would reach the age of Professor Turgot.

Professor T was focused, but at the same time he was humble about the limitations of his knowledge. He sometimes confessed his professional blunders, an error in a calculation, a mispositioning of a target in the cyclotron. The rest of our teachers, almost without exception, projected the impression that they had gotten



PHYSICS

was certainty.

*And certainty, for
reasons of my own
temperament and
perhaps also my*

*middle-class
upbringing,
was my ally.*



RANDOMNESS

had finally won out.

*The world was a
jumble of mistaken
adventures, crossed
wires, mirrors at
odd angles.*

*Certainty was
a deception.*

to where they were on a more or less laser-like trajectory. They had a magnificent self-confidence, which I am sure inspired many of their students. But even I, with my devotion to certainty, did not feel comfortable doing research with such a person. I knew that I made mistakes, and a thesis adviser who did so as well might allow me to graduate with my dignity. After class, Professor T, bulkily slumped against the wall and covered with chalk dust, would sometimes talk to me about his wife. Almost immediately, he began referring to her as Dorothy, so that when I finally met her, at dinner in the Turgots' small house, I felt like I knew her. None of the other professors ever mentioned their spouses. I asked Professor T to be my thesis adviser. He grinned and said I would be doing an experimental thesis.

The laboratory where I began working was a huge cavern of a place, resembling a warehouse more than anything else. The space was filled with natural light, from skylights 30 feet overhead, as in an artist's studio. There was always an odd smell in the lab—not an unpleasant smell—of oil and dry ice. Canisters filled with liquid nitrogen sat on the concrete floor. When opened, these would emit a wonderful hissing noise as the liquid bubbled and evaporated and escaped in thick opaline clouds. Along three walls, stretching for a hundred feet, were table tops and work benches, oscilloscopes, boxes of capacitors and resistors, odd pieces of metal, rubber tubing, geiger counters, notebooks with radioactive decay rates handwritten in neat columns of figures. There were always a few novels by Proust and Gide sitting casually on a lab table. Professor T's wife Dorothy was a scholar in French literature. I like to think that she sometimes visited the lab in the evening, to keep her husband company when he worked there after hours.

In one corner of the lab, a shower faucet protruded inelegantly from the wall, in case someone accidentally came into bodily contact with a radioactive substance and needed to strip down immediately and wash off. The radiation shower I noted with special interest, as I discovered that I had to confront radioactive atoms on a daily basis. My project was to build a device capable of measuring the radioactive disintegration of excited states of neptunium. Neptunium, discovered in 1940, was the first artificially produced chemical element. Since its atomic number, 93, was just beyond that of uranium, 92, it was named for Neptune, the planet just beyond Uranus. (Plutonium,

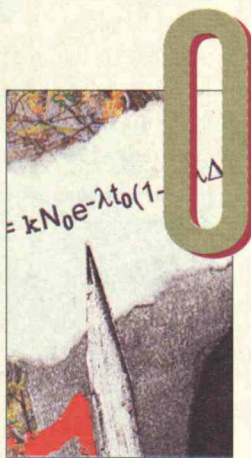
at atomic number 94, was named after Pluto.) The idea for my thesis, as it evolved in discussions with Professor T, was that the excited neptunium would be created by bombarding a uranium target in the cyclotron with deuterons. The disintegrating fragments of the unstable neptunium nuclei thus created, in flight through my apparatus, would energize the atoms of a special gas (argon) and cause them to emit photons of light. The photons, in turn, would be detected by several electronic photomultiplier tubes, which convert incoming light to an electrical signal. By carefully measuring the rate at which neptunium nuclei fragmented, we could learn about forces struggling and churning within the atom.

As I stumbled along, writing up the specifications for various parts to be made in the machine shop and then respecifying when the parts didn't fit, I was helped by Dave, Professor T's assistant. Dave was indispensable. He thought the undergraduates were "bloody communists," and he despised the bearded protest marchers, but he was devoted to Professor T and his students, and he was the only person who could get the vacuum pump to behave. A vacuum pump, when working properly, starts out with a coarse, grating sound, like the chug of a locomotive, then graduates to a clicking whine, rising in pitch, and ends with a quiet, smooth hum when a good vacuum has been attained. When there is a leak in the system, the pump never progresses beyond the rough, grating chugs. On a number of occasions I had to pump all the air out of my tangle of brass fittings and Mylar meshes, down to a billionth of an atmosphere. After applying epoxy and Glyptal to all the suspicious joints, we would turn on the vacuum pump. Dave understood not only that pump but most things in the lab. His understanding went even further than that. I believe he was romantically involved with the woman who delivered small supplies to the lab. After her delivery each week, she would stand at an outside window and look in at him, sadly and longingly.

That winter Dave and I were often the only people in the lab, me puzzling over response curves of the photomultiplier tubes and him quietly fixing some gadget that had broken. Occasionally, I had to stop and walk over to an electric heater for warmth. Outside, the snow lay across the ground in a vast white silence. Then I would hear a squeaking and crunching, distant at first but gaining in volume, the sound of Professor Turgot's galoshes in the snow as he walked along the path from

his office to the lab to check up on his charges.

My apparatus passed all of its preliminary tests, but I never did truly believe that the final experiment would work, and I don't think Professor Turgot did either. When it was time to insert the apparatus into the cyclotron, in another building, I received a mysterious message that the cyclotron couldn't be scheduled until a few months after I'd graduated. "I'll write you about the results," Professor T kindly said to me and gave me high marks on my endless drawings of side views and top views and calculations of solid angles and efficiencies. Professor Turgot never wrote, and I never asked.



ONE SPRING afternoon, soon after Nixon had ordered the invasion of Cambodia, the Department of Physics had an extraordinary meeting. All the physics faculty and students crowded together into a small room to discuss our departmental response to the student riots taking place on campus. With neatly chalked equations still on the blackboard from some previous hour, faculty members got up, one by one, and delivered their views on the war. Most were strongly opposed but not all. There were brief and passionate speeches about the nature of democracy, the rights of governments, the purpose of education, moral responsibility. I could hardly recognize these people dressed up like our measured professors. The little room became a struggling, upside-down box. I needed air. The discussion turned to a practical matter. What should the department do with its students who were cutting their classes? In the end, the faculty decided to exempt seniors from their final exams and, in some cases, their theses.

I reeled out of the room. To my dizzy and confused mind, randomness had finally won out. The world was a jumble of mistaken adventures, crossed wires, mirrors at odd angles. Certainty was a deception. And for me, at that moment in my life, there was either certainty or randomness, nothing in between.

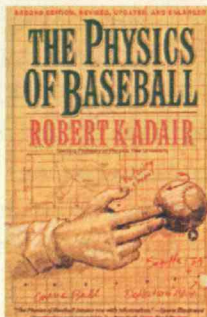
I called Andrew, a roommate from freshman year and a quiet boy like myself. We walked to the lake, a mile away, and went sailing. It was early May. The breeze was so light that we finally lowered the sails and

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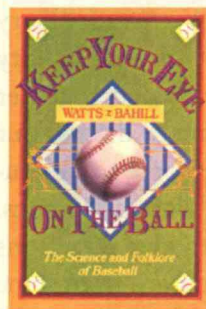
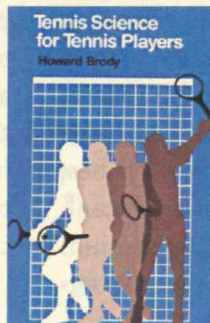
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just drifted, half asleep in the hot thick air. We took off our shirts. Soon we were coasting near one of the shores, passing below willow trees that hung down into the boat and tickled our faces with their soft filigree leaves. Finally, a large branch got tangled in the mast and stopped our motion altogether, and we just lay there, enjoying the shade. I got up from my practically prone position and saw that our boat was surrounded by lilies, floating just next to the shore. A few had started to bloom, luscious white flowers with a speck of purple at their centers. We lay there for hours.

And as we lay there, accidents happened all around us. A bird landed in a nearby tree for no reason and began singing, then flew off just as unexpectedly. Twigs snapped. Clouds changed shape. Grasses rustled with the movements of unseen animals. The earth wobbled imperceptibly on its axis, as bits of cosmic debris randomly bombarded it from space. One such piece of debris, billions of years in the past, had struck with unusual force and cocked the planet over, producing a tilt of 23 degrees, producing uneven heating as the earth orbited the sun, producing the seasons. A crumpled piece of paper slowly drifted past in the water, caught on a stick. Some writing on it had become smeared and illegible, perhaps a schedule of someone's appointments, or a note to a lover. ■

MITnews

FROM THE ASSOCIATION OF ALUMNI AND ALUMNAE OF MIT

APRIL 1996



How Now ROTC?

This spring, the Institute is evaluating its relationship with the Reserve Officer Training Corps (ROTC) program in light of the Department of Defense policy on homosexuals in the military. The review, which is timed to meet the requirements of a 1990 faculty resolution, follows five years of effort, in tandem with other colleges and universities and advocacy groups, to persuade the Pentagon and/or Congress to adopt a position more in keeping with MIT's ban against discrimination on the basis of sexual orientation.

In 1990, the military policy stated that a homosexual *orientation* was sufficient grounds for exclusion. In 1993, however, DoD implemented a "don't ask,

don't tell, don't pursue" policy (evidence of homosexuality must be presented or witnessed; it cannot be uncovered through investigations). Therefore, one's *conduct* rather than simply orientation can now be grounds for exclusion. But even with the modified policy in place, gay and lesbian members of ROTC could be denied options in their personal lives that are freely available to all other MIT students, so the resolution passed by faculty five years ago is still in force.

The first stage of the review—establishing an information base for future decisions—is being carried out by a task force appointed by President Charles Vest and chaired by Professor Stephen Graves of the Sloan School of Management. Under its charge from Vest, the task force looked at ROTC as conducted at MIT, the implications of the "don't ask, don't tell, don't pursue" policy, prospects for future changes by the White House, the Congress, or the courts, and possible courses of action for MIT.

The task force released a preliminary

MEMBERS OF ROTC TRADITIONALLY RECEIVE THEIR COMMISSIONS AT A CEREMONY AT CHARLESTOWN NAVY YARD. IN 1994, SECRETARY OF THE AIR FORCE SHEILA WIDNALL, '60, SCD '64 (XVI)—SHOWN AT THE PODIUM—WAS THE KEYNOTE SPEAKER.

report in late January, with the purpose of outlining MIT's current options and stimulating members of the community—including alumni and alumnae—to make known their views. Community response will be incorporated in a final report and recommendations to the faculty on March 20; faculty will then vote on the recommendations at their April meeting.

Ultimately, decisions about the future of reserve-officer training at MIT must be made by the Executive Committee of the Corporation, but recommendations of the faculty can be expected to carry a lot of weight, remarked Paul Gray, '54, chair of the Corporation.

There is a considerable history

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April 1996

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Victims of Our Own Success

The managers of the Alumni/ae Association recently made a special budget allocation to help cover the cost of paper for MITnews, effective with this issue. The allocation was intended to give us more pages for features, but it turns out we needed almost all of our pages to accommodate this blockbuster issue of Class Notes and Course News. The fact is, everybody is doing their jobs exceedingly well: Association staff are keeping alumni/ae well connected to MIT, graduates are reporting their activities, and class secretaries and MITnews staff are writing them up. While the pressure to keep things concise is not going to let up, we just want to say, "Keep up the good work, folks." —SUSAN LEWIS



ROTC continued

involved in this issue: MIT, as a land-grant institution, has offered military instruction since its first classes in 1865. Its ROTC program, launched in 1917, was the first in the nation, and two years of ROTC training was actually mandatory for all undergraduates until 1959. MIT has been a national leader in developing academically and professionally substantive ROTC curricula, and it has often been noted that MIT was second only to West Point in the number of alumni serving as Army officers in WWI.

MIT enrolls more than 100 ROTC cadets every year, with about 130 additional cadets coming from Harvard, Tufts, and Wellesley, where reserve-officer training was discontinued during the Vietnam War. ROTC scholarships and stipends have helped hundreds if not thousands of students enjoy first-class educations, while providing a stream of officers with technical and managerial know-how to all branches of the military. It has been, in the eyes of many, a win-win situation.

As societal pressure to create opportunities for women and minorities has increased over the years, the military has kept pace, admittedly not without difficulties and signs of stress. The one area in which the services seemed determined not to adjust to a changing climate was in their treatment of homosexuals. As visibility and safeguards for gays and lesbians grew in society at large, there were a number of highly publicized incidents in which respected officers were treated harshly by their superiors when their sexual orientation or life choices became known.

One such case, in November 1989, involved Robert Bettiker, '90, then a Navy midshipman majoring in chemistry, who realized he was gay some years into his education and decided to tell his commanding officer. He was "disenrolled" from the Navy, which also demanded that Bettiker repay the \$38,612 in ROTC scholarships he had received. With the help of members of the MIT community and Congress, Bettiker (now a third-year medical student at Georgetown University) succeeded in

convincing the Navy to waive the repayment demand. Nevertheless, his experience heightened consciousness of the gulf between MIT's nondiscrimination policy and the practices of the military. Awareness was further raised the following year by a much-publicized letter from then-Provost John Deutch, '61, to Secretary of Defense Dick Cheney, asking Cheney to reconsider the DoD ban on homosexuals, which Deutch termed "wrong and shortsighted."

In fall 1990 came the faculty resolution calling on the MIT administration to make a concerted effort to bring about change in military policy and to review the situation in five years, with an eye toward "making ROTC unavailable to students beginning with the class entering in 1998" if "adequate progress" was not made on the treatment of homosexuals.

There was a rush of optimism surrounding this issue during the 1992 presidential campaign because Bill Clinton promised to lift the ban on gays in the military by executive order. The late Les Aspin, PhD '66 (XIV), the first secretary of defense in the Clinton administration, presided over efforts to implement the president's campaign promise, but in the face of congressional opposition, the best Aspin could do was negotiate the "don't ask, don't tell, don't pursue" compromise. With Congress's swing to the right in 1994, the possibility of DoD moving closer to the nondiscrimination policies subscribed to by the majority of U.S. universities has become vanishingly slim, despite steady, collaborative lobbying.

Which brings us to 1996 and MIT's current options. At opposing ends of the spectrum, the Institute could either maintain the status quo or it could sever all ties with ROTC. The task force also identified three intermediate options: MIT could postpone any action (for a specified or unspecified period), and consider continued activities to influence DoD, the Congress, and the outcome of relevant court cases. It could create an arms-length relationship, under which ROTC would function as an independent program renting Institute space. Or it could terminate ROTC as a campus program and make arrangements for MIT students to participate at a nearby program, such as Boston University. Additional courses of action may be proposed by the community.

In its interim report, the task force

does not make recommendations, but rather lays out all the arguments that have been advanced for and against each option—for purposes of stimulating a discussion that will take place via campus forums, the Internet, and other media.

Among the related topics on which the task force particularly would like to hear from alumni/ae are: If you served in ROTC, what did the experience mean to you? What value does ROTC have for the Institute/for the nation? Do you think MIT should be out front on the issue of military treatment of gays and lesbians, or should it follow the lead of Congress and DoD? Do you think that “don’t ask, don’t tell, don’t pursue” is an adequate compromise policy?

To meet its charge from President Vest to gather community input, the task force on ROTC has set up an electronic mailbox for all comments: <rotc-comment@mit.edu>. (Task force members cannot reply to messages, but they do promise to read every one.) The task force has also set up a page on the World Wide Web where users can read the interim report and other materials, access resources offered by interested organizations, and record comments <<http://web.mit.edu/committees/rotc>>. Given the tight schedule for deliberations, fax is the best alternative to Internet communication on this issue: Comments may be faxed to task force chair Stephen Graves at (617) 253-1462. And alumni/ae may fax requests for more information to the Alumni/ae Association, addressed to Robert Dimmick, (617) 258-6211. □ —*Susan Lewis*

Rethinking Undergraduate Education

What should a college education be? More important for us, what should an MIT education be?

MIT will be reexamining those important questions with two new task

forces, one on student learning (academic and curricular issues) and one on student life (residential and campus activities, enrollment, facilities, out-of-classroom educational experiences). Both task forces were created by President Charles Vest and will be coordinated by Dean for Undergraduate Education and Student Affairs Rosalind Williams, who is also the Metcalfe Professor of Writing. Together, the task forces constitute the first comprehensive review of MIT’s education and student life framework in decades (since the Lewis Commission of 1949, the Zacharias Committee in 1964, and the Hoffman Commission in 1970—of which only the Lewis Commission included a broad look at student life).

Much has changed in the intervening years. While the traditional MIT core subjects (physics, chemistry, math, lab experience, and humanities) remain in place, and the ubiquitous problem set is still the rule in many of these classes, there have also been significant changes. Biology was added as a requirement, for example; freshman year is pass/no credit; and weekly exams have been absent for more than a quarter of a century. Huge lectures accompanied by smaller recitation sections are no longer the only strategy for teaching the core subjects, and teamwork has been woven into 5.11 (principles of chemical science) as an explicit goal.

Many aspects of student life have also changed markedly, beginning with the sharply increased diversity in the student body—culturally, racially, and ethnically. (The freshman class this year is 42 percent female and 14 percent underrepresented minorities.) But there are also many constants in student life. MIT students still take their work seriously, and their play, too. And, for whatever reasons, many students going through MIT still find that “Tech is Hell” and damages their self-esteem.

Of course, the world outside is changing, too. Dean Williams notes in her charge to each of the task forces, for example, that “students who plan for careers in science and engineering will need more thorough preparation in areas that are distinctively practice-oriented but not narrowly technical, such as economics, communications, global perspectives, and entrepreneurial skills.”

She suggests that the task forces look at questions like whether the present organization of the faculty serves MIT’s

A LETTER FROM THE ASSOCIATION PRESIDENT



Karen Arenson

educational purposes, what innovations in information technology might benefit students, and how residence-based experience might be coordinated with that in the classroom. In other words, the questioning will run deep.

The spirit of reexamination and experimentation seems to be in the air. Probing questions about what constitutes an appropriate undergraduate education are being asked at other universities, too, in both formal and informal processes. There has been widely publicized debate, for example, over whether the traditional “great books” curriculum taught at many universities is too oriented toward white male authors, and many schools have chosen to infuse their curricula with a broader mix of writers.

A number of engineering and science-oriented colleges and universities are revising their courses and undergraduate programs. Rensselaer Polytechnic Institute, for example, is launching a comprehensive curricular reform that builds on more interactive learning techniques through an approach that they call “studio learning.”

At Princeton University, a group of alumni is developing its own proposal for Princeton in the 21st century (“Paths to More Effective Undergraduate Education”), which it hopes will lead Princeton into a “much more active and ‘caring’ posture with respect to many of our most pressing domestic problems.” Among the qualities missing in current graduates, the alumni proposal suggests, are skills like the ability to listen and hear; to speak and write clearly; to define problems; to work as part of a

team; to function in an ambiguous, complex, and rapidly changing environment; and to act in an ethical, moral manner.

Can a college really help students learn to do all of those things? They seem like laudable goals, but there are likely to be no simple ways to achieve them. In addition, the answers that an RPI or a Princeton may come up with are likely to differ from those at MIT. But the process of examination at all of these institutions is a healthy one.

At MIT, Dean Williams has stated clearly that the task forces must work "with a high degree of community involvement." A recent meeting of the Corporation Joint Advisory Committee (CJAC)—a group of students, faculty, staff, and MIT Corporation members who meet periodically for discussions on topical issues—focused on undergraduate life and education. Present students, faculty, and staff were all very interested the reflections of alumni/ae

on their own experiences at the Institute from the perspective of years or even decades after graduation. Dean Williams says she hopes that grads will stay involved as the task forces begin their work.

The Alumni/ae Association will be working with Dean Williams to develop appropriate ways for grads to offer their own views, possibly through questionnaires, discussion groups, or written input. Start thinking. □

Karen Arenson

KAREN WATTEL ARENSEN, '70,
President, Association of
Alumni and Alumnae of MIT;
<dhbm13d@prodigy.com>

SERIOUS ABOUT LEADERSHIP

In the January issue of MITnews, both the article on the Alumni/ae Leadership Conference (ALC) and the column by Association President Karen Arenson, '70, focused on leadership—how we define and demonstrate it and how MIT might develop leadership qualities among its students. The topic seems to be one whose time has come: President Charles Vest, Provost Joel Moses, PhD '67 (XVIII), and the staff and volunteers who set the agenda for the Alumni/ae Association are eager to continue—and widen—the conversation about leadership and how it might be nurtured. As steps to involve in this discourse those alumni and alumnae who did not attend the ALC, the Association linked a report on the conference to its World Wide Web page at <<http://web.mit.edu/alum/www/Information/Volunteering>>, and it is offering a three-hour videotape of conference excerpts. To order copies of the video at \$20 each, contact Sharlene Blake, Alumni/ae Association, 77 Massachusetts Ave., Cambridge, MA 02139, (617) 253-8245, <sblake@mit.edu>.

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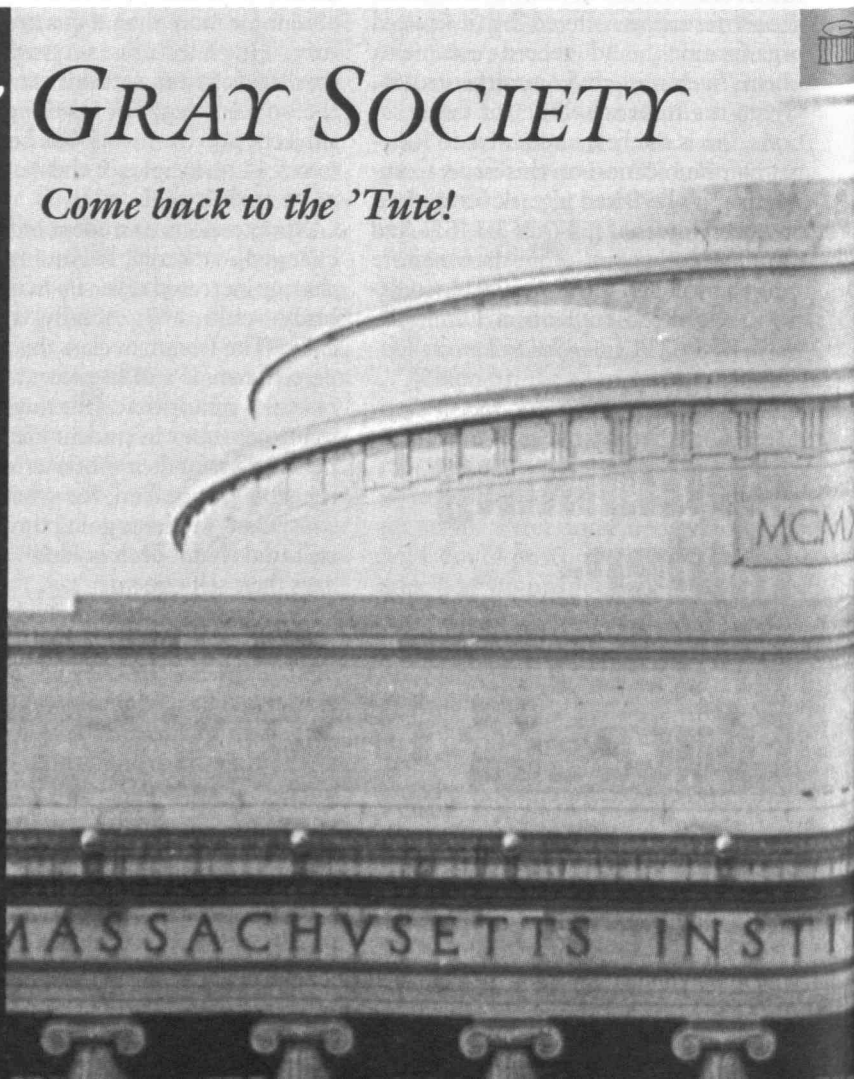
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ClassNotes

21 75th Reunion

Through the MIT Alumni/ae Fund, our several class scholarship and similar individual funds are updated during an annual drive at this time. We are pleased to have an overall summary of the year's aid to students. The superb administrative staff in Cambridge tells us that two students are receiving aid in 1995-96, replacing Randy Hyon, who was graduated last June, and Zia Ahmed, who has another source of funds.

Angela Chang, a junior from Hialeah, Fla., majoring in mechanical engineering, is maintaining an outstanding academic record. Outside the classroom she is VP of her dormitory and active in the Undergraduate Association for which she serves on the Judicial Review Board and the Nominations Committee. She also is a member of the team which has built MIT's entry in various solar car races nationwide and in international competition. In her spare time, Angela enjoys playing badminton and volleyball on the intramural level and belongs to Alpha Phi Omega, a national service fraternity.

Sophomore Gregory Roulette comes to MIT from Shaker Heights, Ohio. He has chosen a major in chemical engineering and already is beginning to compile an excellent academic record. He, too, is active in the Undergraduate Association and has been elected VP of the Class of 1998. Gregory also has joined Phi Beta Epsilon fraternity and sails for the MIT varsity sailing team. He is considering a career in medicine after completing his course at MIT.

We owe sincere thanks to Audrey Ellis Saracco, program coordinator, for the report which she concludes with: "Thank you and your classmates for continued generosity which enables the Institute to maintain its commitments to such fine students."

We're proud and honored in suggesting that friends and family specifically name the Clarke fund to ensure that outstanding, needy undergraduates such as these continue to be selected for aid by MIT.

Please tell us now if you (and guests) may attend our 75th Reunion luncheon during Technology Week this June.—**Carole A. Clarke**, president and secretary, 608 Union Ln., Brielle, NJ 08730-1423; tel: (908) 528-8881

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Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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Did you know the Massachusetts Institute of Technology was incorporated in 1861? Then, in 1916 the Institute added itself to Cambridge. Late one August afternoon, a procession, its members clad as Venetian sailors and led by a marshal in the crimson and velvet of a doge, moved slowly to the river's edge in Boston. Followed by a group of men in gowns and crimson hoods, and bearing a great gilded and ornamental chest containing charter and archives, the solemn procession moved forward. They were met by a Venetian barge, which, under the eyes of 10,000 spectators, bore them away to the other shore.

Harry Green passed away in October. He had an SB in mining and metallurgy and was widely known for his knowledge of nonferrous metals. In 1960 he organized his own company in New York. He attended our 70th Reunion. He loved boating and fishing.—**Royal Sterling**, secretary, Apt. D-201, 2350 Indian Creek Blvd., W. Vero Beach, FL 32966-5103; tel: (407) 562-3937

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A handwritten note from **Blanchard D. Warren** in Oregon gives some astonishing statistics. He informs the class that he has been an alumnus for 71 years. He has been widowed three times, has five children, 14 great-grandchildren and one great-great-granddaughter. He also states that he lives alone. Congratulations to Blanchard.—**Co-secretaries: Colonel I. Henry Stern**, 2840 S. Ocean, #514, Palm Beach, FL 33480; **Katty Hereford**, 237 Hacienda Carmel, Carmel, CA 93923

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The class has suffered a great loss with the death of **Sam Spiker** on November 2, 1995. Sam was at his summer house in Dublin, N.H., preparing to move down to Westwood, Mass., for the winter months. For nearly 20 years Sam was our class agent and devoted much time raising funds for MIT. Also, he served on reunion committees planning and carrying out resulting class gatherings. Over the years, he was always a willing volunteer for alumni/ae activities. He served on Alumni/ae Association committees. His status as an alumnus was recognized in 1975 when he received the Bronze Beaver Award.

Sam was well known in Dublin, N.H. He was very active at the nearby Sharon, N.H., Arts Center, a trustee for many years, VP 1981-1984, and later an honorary trustee (life). Also, he was active in the Dublin Walk-

ing and Riding Club and was a member of the Dublin Golf Club.

Sam received an SB in Course XV. After working for several companies, he went to the U.S. Army Air Corps Flying School at Kelly Field, Tex., and graduated as a second lieutenant and military pilot in 1928. During World War II, he served in the Material Command, U.S. Army Air Force at Wright Patterson Field in Dayton, Ohio. He retired as a major in 1945. He was employed with the Kinney Shoe Co. 1930-1942 and 1945-1968, retiring as VP, treasurer, and director in 1968. He is survived by his wife, Elinor (Brown) Spiker.

The passing of two more classmates must be reported. **Col. Edgar R.C. Ward** died in Falmouth, Maine, on August 19, 1995. He had served a number of years with the U.S. Army Artillery at Ft. Bliss, Tex. By 1961 he had retired. . . . **Emanuel Tarplin** died on November 22, 1988. He had resided in New York City working for the L.W. Frohlich Co. At the time of his passing, he had moved to East Falmouth, Mass.—**F. Leroy "Doc" Foster**, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

26 70th Reunion

Crockett A. Harrison writes to tell us that **Laurel Lane Farm** has been sold. He and his wife now reside in Green Ridge Village, a retirement community. Though he has been retired since 1968, he has done extensive traveling. He is also interested in genealogy, with two privately printed books on family history. He has five daughters, 13 grandchildren, and six great-grandchildren. . . . **Winslow H. Hartford** enjoys being a reporter for classes other than his own. He was a TA in 5.01-5.02 in 1929-1933 and has maintained contact with several alumni/ae from 1927-1937, as well as members of earlier classes who rarely correspond with their secretaries. One such person is **Martin Grossman**, a very active 90-plusser who is an active member of Golden K. Kiwanis, Engineers' Club, and senior scholar in Charlotte. A native of Holland, Martin has long been an avid ice-skater. He celebrated his 90th birthday a couple of years ago by going ice-skating at a shopping mall.

We regret to report the following deaths: **George E. Armington** of Cleveland on February 17, 1995; **Alexander Hanks Brown** of Nashua, N.H., on October 26, 1995; **F. Martin Towle** of San Mateo, Calif., on June 7, 1995; and **Susan D. Mattuck** of Weston, Conn., on May 20, 1995. George received a master's degree from MIT after only one year of study. For 22 years he was a supporter of and served on the board of directors of the

College of Wooster. He was chairman of the board of Grand River Academy in Austinbury. George is survived by his wife, Helen, whom he married in 1927; daughter, Marjorie Armington; eight grandchildren; and four great-grandchildren.

Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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Carleton G. Davies died on November 1, 1995, after an extended illness at his residence in Charleston, S.C. He came north to attend Phillips Exeter and during MIT days

found Harriet Goodacre in West Newton. After many fraternity dances, they were married in 1928. They recently observed their 67th anniversary.

Carl was a wholesale lumber broker with Coney-Davies Lumber Co. in Charleston all his working career. He served on the advisory board of the First National Bank and on the Eastern Homes Board. He was appointed to the Ashley Hall School Board (a private girls school), and he was proud to have an auditorium named for him.

He was a past commodore of the Carolina Yacht Club and Carl, and his family enjoyed a boat for many years. He was also a member of the South Carolina Society, St. Andrew's Society, and the New England Society. He was an active member of St. Philips Church having served as a vestry member and senior warden. He was a loyal alumnus of MIT and certainly lived a full life.

Besides his wife, Harriet, he is survived by a daughter Patience (Penny) of Charleston, a grandchild, and two great-grandchildren.

Lyndall Raymond Perry died on August 30, 1995, at his home in Mendham, N.J. A chemical engineer, he had been a production manager with Allied Chemical Co. in New York, where he had been employed for 42 years before retiring in 1967. Born in Beaver River Nova Scotia, he and his wife Doris lived in Old Greenwich, Conn., before moving to Mendham 32 years ago. Besides his wife, surviving are two sons and six grandchildren.

Lauritz H. Rasmussen died on November 12, 1995, at his home in Quincy, Mass. He was a structural engineer for the Commonwealth of Massachusetts for more than 30 years, specializing in bridge design and construction. He retired in 1967. A resident of Milton for many years, he moved to Quincy in retirement. He leaves a son living in Newstadt, Germany, a daughter, and two grandchildren.

We send our condolences to the wives and families of these classmates.—**Joseph C. Burley**, secretary, 1 Harbourside Dr., Delray Beach, FL 33483; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

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It is unfortunate that the time of writing these Class Notes is at Christmas and the time of reading at the Easter season, but we have a death to report.

Henning Waldemar Hanson passed away February 9, 1995, in Whitman, Mass.

George Mangurian and his wife, Peggy,

Don Brookfield, '32, Sets the Industry Standard

Brookfield Engineering Laboratories in Stoughton, Mass., founded by Don Brookfield, is perhaps the leading viscometer manufacturer in the world. That may not mean a lot to the person on the street, but in fact there are well over 150,000 Brookfield Viscometers in use today, and the company, with only 165 employees, has a customer list of more than 30,000.

Primarily used in the chemical processing industries, Brookfield viscometers also

have applications in food processing, pharmaceuticals, oils and asphalt, inks, paint products, and biological fluids.

"By the time I attained the ripe old age of 7, I had decided that the course of my life would be to attend MIT and become an inventor," Don Brookfield told his class secretary, Melvin Castleman. Then in 1933, goal achieved, Don's father was in a group attempting to go into business making synthetic resin. A requirement for controlling the production was a viscometer."

"The McMichael viscometer was acknowledged to be the best at that time and, at \$250, it was the most expensive," Don explains. "Just out of school and needing a job, I brashly offered to make one for half the price (this, without ever seeing one except in a catalogue). I estimated 10 weeks for construction at about \$12 per week, income, not bad in 1933!"

It took a year, however, and some 10 to 12 designs before Don had a model suitable for production. Then, upon recommendation by Professor M. DeKay Thompson, Don became the Gillette Safety Razor Co.'s elec-

tro-chemist. It was also at that time he met and later married "a delightful young woman, Phyllis Brown."

While working for Gillette, Don sold viscometers—six in 1935—to customers like General Electric in Schenectady and Standard Oil of New Jersey. "All were very supportive and enthusiastic, particularly when we kept exchanging their units for new and improved models at no charge, some as many as five times," says Don.

In 1939, with Phyllis's support, Don became a full-time entrepreneur. "That summer a man offered us \$5,000 cash for half interest in the business," he remembers. "Virtually penniless, we were sorely tempted, but we turned the offer down because we were afraid he'd lose his money and we didn't want to be responsible.

"By December 1941 we had sold and delivered several dozen instruments and were getting into war work. A number of our customers had sufficient clout to get us a top rating so we could get supplies for the viscometers. One customer was concerned with producing the atom bomb," Don relates. "A major achievement of ours was producing an essential component of airborne radar."

After the war, Brookfield Engineering stuck to its area of expertise. "We now have instruments in use on every continent, and agents in virtually every industrialized country," Don says. "We have been told that there are more industry standards written around the Brookfield Viscometer than any other single instrument in any field." □



DON & PHYLLIS BROOKFIELD

have decided that their traveling days are over and have moved to a quieter life at Leisure World in Silver Springs, Md., but are hoping to attend our 70th Reunion in 1998. That sounds like the end of time doesn't it? But let us think ahead positively to that notable event.—**Ernest H. Knight**, secretary and president, 168 Ai Plummer Rd., Raymond, ME 04071-6349

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Vincent "Jerry" Gardner writes to say that class agent **Bill Bowie** is actively trying to obtain funds for Class of 1929. He also notes that out of the present 135 members of

'29 only 41 are active—what has happened to the remaining 94? He asks that each of you make yourself known, and when you do, please make a donation no matter how small. Class members would like to know you are alive and doing something. He also would like to remind you that the 70th Reunion is coming in 1999 and that it would be great to have you there.

Rolf A. Zurwelle says that his papers on gravitation and space energy are filed in the archive library. He is still interested in the well being of MIT and will continue to send donations to show his support.

Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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On relatively rare occasions I find it difficult to meet the *Review's* deadline for Class Notes. Mid-December 1995, when this memo is being written, has proved to be such an

occasion. Let me explain why.

For most of the past five years, I have used a Mac SE computer coupled to an HP Deskwriter printer. Several months ago I acquired some updated equipment. Recently I donated my surplus equipment to the Mens Club here at Williamsburg Landing for the purpose of establishing an "in house" computer school. The present plan is to have computer-experienced residents give one-to-one lessons to those residents who would like to acquire computer skills. We are currently engaged in recruiting volunteer teachers for this school and formulating a curriculum. We hope to initiate a teaching schedule by mid-January.

Implementation of the school project plus the usual holiday activities has created a time crunch for me. I plan to report the accumulated class news in the next issue of the *Review*.—**Gordon K. Lister**, secretary, Apt. 40-D, 5707 Williamsburg Landing Dr., Williamsburg, VA 23185

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65th Reunion

We've received word from the following people regarding the class reunion in June. **John L.**

Olsen along with his wife, **Laura**, plan to attend, even after he has suffered a small stroke. He has been married for 63 years now and has two daughters, six grandchildren, and

eleven great-grandchildren—a wonderful family! . . . **Ben W. Steverman** and his lovely wife, **Claire**, plan to come to the reunion and will bring you up to date on all the Class of 1931 news. . . . **John Swanton** and his wife, **Louise**, say they will certainly be there if they're able. They just sold their house in Newton, the house they lived in for 61 years, ever since they were married! They now live in Maine and are there permanently. . . . **Eugene G. Branca** has moved into a senior retirement community. It fulfills his needs—convenience, security, and no responsibilities. He plans to attend if his health permits. . . . **Albert R. Sims** and wife are not sure about their plans yet but will attend if possible. . . . **Frances M. Roddy** is also not sure about his plans. He would like to report that **Gilbert M. Roddy III** was born in May 1995. Congratulations to the family!

The "sorry, but can't make it's" follow. **Gordon S. Brown**, now retired from the project that he undertook with **Jay Forrester** about nine years ago to introduce system dynamics into the Catalina Foothills Public Schools, can't make the reunion because of health problems. . . . **Mrs. Thoresby P. "Vera" Slack** writes, "Many thanks, I am 92 years old now, and my traveling days are over. Good luck to all!" . . . Recovering from a stroke, **Edward B. Hubbard** will not be able to attend and is sorry to miss it. . . . **Alexander H. Kuhn** is grateful to be in good health and grateful to MIT and many good people for the fact that he has been able to enjoy retirement. To show his gratitude, he spent 12 years as a volunteer math tutor for the 20 smartest sixth graders at his local elementary school. He says, "Some of you might like to try it!" . . . A big hello comes from **Henry Randall**, who also says he "does not travel easily, sorry!" He wants to say hello to ancient VI-A flyers and secretary **Beynton**.

We have several deaths to report this time. **Charles W. Seaver** died November 5, 1995, in Needham. He and his wife enjoyed the 60th Reunion in 1991. Both **Charles** and **Mildred** were always interested in gardening and worked to hybridize hosta since 1982. The results of their work will be featured in an educational exhibit at the Boston 1996 Spring Flower Show. . . . **Benjamin Prescott Hazeltine III**, passed away March 7, 1995, after being ill for many years. His son, **Prescott Allen Hazeltine**, says he hopes the 65th Reunion is a resounding success. In spite of the bad news, he felt that anyone who knew his father would want to know of his death; **Harold R. Kuudsen** passed October 29, 1976. . . . **George M. Bunher** passed 11 years ago. As we know, he contributed a great deal with his many friends. God bless him. . . . **Frank E. Garratt** passed October 3, 1995. . . . **William F. Robinson** passed May 21, 1995. "He was a remarkable professor of the teachings of life," writes **Ann Robinson**. "He was admired and loved by all who were fortunate enough to know him. He was a rare family man with whom family always came first, and he is missed." . . . **Henry G. Hartwell** reports classmate **Clifton A. Smith** passed away on July 9, 1995. He will be remembered by many of the Class of 1931. **Henry** is not sure of his plans at this time regarding attending the reunion.—**Ed. (Wyman P. Boynton, secretary, 668 Middle St., Portsmouth, NH 03801)**

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Our president, **John Brown**, called several of us to meet on December 11 to start planning for our 65th Reunion in June 1996. The following were able to attend. **Albert O'Neil**, **Rose** and **Tom Weston**, **Melvin Castleman**, and **John Brown**. The Alumni/ae Association was represented by **Elizabeth Simons** and **Audrey Saracco**.

John Brown reported there was about \$600 in the class treasury. **Ed McLaughlin** has resigned as our class agent. Some appropriate plaque will be presented to him for his diligent work: **Russell Robinson** was nominated to be our new class agent. **Albert O'Neil** has agreed to chair our 65th Reunion. **Tom** and **Rose** will co-chair. At the proper time a letter will be sent to our 176 classmates and to 84 widows with full information about the reunion.

Russell Robinson has taken up writing. His first published novel is *A Man for all Ages*, which came out early in 1995. If you want to read a good book, call Vantage Press in New York City at (800) 882-3273. His second book is awaiting publication. He writes that **Sylvia** and he are keeping busy but at a slower pace. They plan to attend the 65th Reunion.

We are pleased to learn that **Carl J.H. Wahlstrom** is slowly recovering from a stroke.

Fifty years ago **Lawrence Berk** started the Berklee College of Music. Today it is considered the world's foremost jazz and pop college. It has 2,650 students from more than 70 countries. I can send anyone who wants a long account of the school's record and **Lawrence Berk's** efforts if they write me.

We have received word that **Alfred A. Muliken** died on September 20, 1995, in Fort Myers. He was a member of Beta Theta Pi fraternity and Tau Beta Pi scientific honorary society. He was formerly executive director of Chemical Specialties Manufacturers Association of Washington, D.C. He was a past-president of the Whiskey Creek Country Club and a member of the local chapter of SCORE for the past 20 years. He is survived by his wife, **Elizabeth**, four children, and eight grandchildren.

We also learn that **Stanley Rudnick** died on March 9, 1995. When we receive more information we will pass it on.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907-1643; tel: (508) 531-0053

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At this writing I am thinking seriously about taking a balloon flight for the sole idea of knowing what it must be like "to be flying so high in the sky." Advertisements in the

Chicago Tribune suggest it's the penultimate Christmas gift, but I simply want to experience what the champion balloonist of our time feels like when he separates himself from the confines of the earth. Seems as though **Dick Fossett** and **Charalee** have graying hair waiting on the next exploit of their very famous son **Steve**, who they say is now planning to fly his balloon around the world. **Charalee** ventures to say that the **Fossetts** were to be in their second home near **Portola, Calif.**, this past Christmas.

Congratulations on the 60th wedding anniversary of **Italo "Pat" Amenta** and his

wife, Mary. Their three married daughters and offspring have good reason to celebrate. My opera-loving classmate is now retired after working with GM for most of his career, and he and Mary enjoy Elderhostel-hopping here and abroad. Italo was a transfer from Wesleyan U. He played on a great basketball team along with the late Adam Sysko, its co-captain, with a brilliant record of 10 wins and 2 losses. At MIT, he let me in on a secret to MIT's success in teaching. He had an applied mechanics professor who handed out completely different problems to each student, failing which you had to linger after class and get it straight. He was known to Italo and his students as slave-driver Smith.

We are glad to hear from **Stanwood I. Williams**, who came to MIT with a BS from Stanford U. After MIT, he worked as a troubadour for Doherty Oil Co., a small family-owned California business. After a succession of buyouts and firm name changes, Stanwood became his own master and contractor, drilling both onshore and offshore. Owning as many as 15 drilling rigs, he says that for 30 years he remained a private contractor drilling in this country and abroad. In 1970 he became a consultant. He's now retired.

The worst part of a class secretary's duties is to try and say the farewells. **Robert Burton Kinraide** passed on August 31, 1995, as reported by his daughter, Dorothy Welch. Kinraide was for many years chief engineer with Standard-Thomson Corp. in Waltham, Mass. A real outdoors person, he hunted, fished, skied, white-water canoed, and filmed all these pursuits.

From the *Boston Herald*, we learn that **John I. Lynch** passed on September 23, 1995. He served 55 years with the Hodge Boiler Works, East Boston, Mass., where he was its president upon his retirement in 1990. At MIT, he was a diver on the swim team. A lifetime member of the Massachusetts Charitable Mechanics Association, he also was for many years a trustee of the East Boston Savings Bank. He is survived by his wife of 60 years, Rosalind Harris Lynch, a sister, and six grandchildren.

In the company of many president heavy hitters out of Course VIII, physics, the passing of **Horace Leavenworth Newkirk** is noted as September 26, 1995. Notification of his passing was from his daughter Nadenia. The year 1945 found him with the China Lake, Calif., Naval Ordnance TC (now called the China Lake Weapons Center) working on rocket-exterior ballistic missiles. For this wartime service, he received a meritorious award from the Navy. A member of Toastmasters International, he obviously enjoyed public speaking. He also enjoyed skiing and viola playing.

Upon receiving an obituary notice from Laura Zeisler (his step-granddaughter), I have learned that **Leon Hyzen's** wife, Didi, passed on before himself. I believe that Leon and Didi visited the School of Architecture in June 1994. Leon and all the rest of the architectural graduates knew the meaning of "en charette." To you engineers out there, it is akin to "sweating out the details" and that is exactly how this report gets done. Do send details and the Class Notes will come out accurately and with my "thank you."—**Berj Tashjian**, secretary, 1245 Briarwood Ln., Northbrook, IL 60062-4556, tel: (847) 272-8683

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In late October the reunion committee had another semi-reunion at Hilltop Steak House in Braintree, Mass., augmented by a few recruits from the Cape, **Earl Lockhart** and wife,

Helen, and **Bill Ball**, our original class secretary who did a great job for many years. Also in attendance were **Jeri and Larry Stein**, **Norm Krim**, **Barbara and Tom Burton**, **Mary and Russ Hastings**, **Gudrun and George Gahm**, and **Mollie and Carl Wilson**. For classmates interested in attending the next luncheon, it is being held at the same location on April 23 at 1:00 pm. Just call Larry Stein at (617) 749-1612 or Carl Wilson at (617) 527-7088 after April 1. You are all cordially invited!

Tom Burton has been waging war against squirrels who are digging up his beautiful lawn, but he is not abetted by wife Barbara, who has become attached to one of the runts of the many litters the Burtons have had on their property. She has named him Sammy, and has been trying to tame him and teach him a few tricks. She claims he is highly intelligent and comes to her window regularly for his lessons. . . . Larry Stein expressed the need for a quick test to determine whether a cup of coffee in a restaurant is decaffeinated or not. One of the world's foremost authorities on coffee, **Earl Lockhart**, was sitting at the table. He has written three books on the art of making coffee. Earl, who had been associate professor of food technology at MIT, and then went on to Coca-Cola where he was an assistant to the vice-president of the Corporate Technical Division. He had previously been scientific director of the Coffee Brewing Institute. In that capacity he developed new rules and procedures for making coffee in restaurants, and at home. He developed the glass coffee makers, like Mr. Coffee, which was the parent of all the modern coffee makers. Earl felt it would not be difficult at all to develop the test that Larry wanted. Larry, however, was unwilling to fund the research!

Upon discussing **John Borger's** story (in the *January Review*) about the Pacific crossing of the Pan-Am Clipper, Larry told us he had a stamped envelope that was on the maiden flight of the Pan-Am Pacific Clipper. . . . Bill Ball says he hears from **Ed Asch** occasionally. Apparently, the Aschs are busy traveling. . . . **Paul Wing** gave another lecture recently in Hingham on three-dimensional photography, attended by the Steins. . . . **Gudrun Gahm** sends news (your secretary has been spelling it "Gudron" and it should have been "Gudrun"). The Gahm's grandson is a bassoonist in the Pittsburgh Symphony Orchestra, which played at Symphony Hall in Boston

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recently. The Gahms had 14 for brunch to celebrate the occasion. One of the daughters who attended the brunch is moving to Seattle, where she and her microbiologist husband have bought a 100-year-old house on three and one-half acres of land. The Gahms were planning to visit them for Thanksgiving and go on to San Jose to visit the mother of the bassoonist.

Ellie Kron writes: "What a great job you are doing for the Class of '34 in the *Technology Review*. While I don't know most of the people, I keep thinking how much **Phil (Kron)** would enjoy the news of all these classmates." Ellie goes on to express how much she misses Phil. She's not going to Florida this year and says she doesn't mind the "cold Canadian air." After shredding bags of paper to be recycled, she advises not to hang on to so much stuff! The class misses Phil, too. He was a great guy—warm, high-spirited, and everyone's friend. Your advice on saving stuff is very good, but difficult to follow.

A note from **Margaret Z. Freeman**, who received a master's in mathematics in 1934. Margaret was married to **Serge Zarodny**, a graduate student in Course VI at that time, but is since divorced. While at MIT, they listed their home address as Manchuria. She now lives in Belmont, her health is great, she has three children and she keeps very busy. She traveled to Russia in 1995, to sightsee and to do research work in the archives for her memoirs. They are almost finished. She does not tell us if and when they will be published. She plays an occasional game of tennis, and claims that she is terrible. She rarely plays chess, although she rates herself fair at that activity.

Another note from **Robert Gow**, who worked for the Oklahoma Gas and Electric Co. for many years. Both he and his wife are in good health. They have two children and three grandchildren. They are living in Ardmore, Okla., where Ralph keeps busy teaching Sunday School, is the representative of the USO, on the board of the United Way, and is an active member of the Chamber of Commerce. He recently drove to Virginia Beach to attend a reunion of the crew of the Destroyer Escort USS *Acree* on which he served in the South Pacific over 50 years ago. He does some reading and exercises regularly. He keeps fit with floor exercises and walking.

A pleasant note from a gal in the Alumni/ae Office after reading the '34 Notes for Novem-

**Class of '34
Reunion Committee making a head start. Below: Larry & Jerry Stein.**

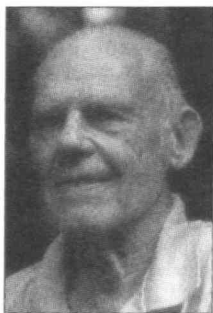


Above: Norm Krim, Earl & Helen Lockhart

ber/December: "My mother always told my sister and me about the road sign in Connecticut that announced Lake Something-far-too-long-for-me-to-remember-or-pronounce-so-long-in-fact-I-never-believed-her. Your column has convinced me to reinstall my faith in her and her wild stories! I will send her a copy of that page and apologize, humbly." [Lake Chargoggagoggmanchaugagoggchabunagungamogg, for those who missed it—*Ed.*] . . . **Nate Goodman**, writes from Florida (November) that he is in good health as is his wife. They have two children and two grandchildren. Nate's son has taken over his father's dental practice, allowing Nate some Florida time. They have been traveling to California as well. Nate says he still spends some time with his dental practice, when he is not playing golf. He feels that he is making real progress with the game. Golf and walking provide regular exercise. He never sees any of our classmates. . . . **Huntley Child's** wife, Betty, writes that Huntley died on September 8, 1993, of melanoma. She notified his fraternity, but apparently the word never got around. Besides Betty, there were three children, eight grandchildren, and ten great-grandchildren. Only one child survives.

Meeting with **Felix Conti** about a week after receiving Ellie Kron's letter, Felix produced probably one of the last letters Phil wrote as class agent in May 1993, in which Phil refers to Felix's comments in the winter issue of *Civil and Environmental Engineering at MIT*. Phil says, "Keeping busy doing the things we can do best is important for us octogenarians." Felix and Phil were both Course I. The meeting with Felix provided a great deal of material, which will be the subject of another column.

Eugene Magenau writes from Tustin, Calif., that he lost his wife in September of 1995. His own health is only fair, as he suffers from



Eugene Magenau

peripheral neuropathy. However, he exercises regularly, and does a great deal of walking. He visited New Hampshire last spring for his 67th reunion at Dartmouth, his other alma mater. While East, he visited his old home on Ragged Mountain, N.H., and then on to Washington, D.C., for a four-day visit.

He does a lot of reading, favoring adventure and biography. His favorite reading: James Michener, Winston Churchill, and *Technology Review*. He sends regards to all his friends. Another letter from **Sam Untermeyer II**, also from California. Sam recently provided the space for the local MIT Club to entertain recent graduates at a barbecue. There were 205 attendees. He has traveled recently to the Gaspe Peninsula and the Adirondacks. He does some reading, and history is his favorite subject. . . . **Charlie Finnegan** has a nice long letter telling us of things in Orlando, Fla. He rarely sees any classmates although they are trying to reorganize the local MIT club. After retirement, he became a real estate broker and acquired a string of income properties that keeps him occupied on a part-time basis. He

lives on a lake and sails and fishes occasionally. He also has a pilot's license but has not flown recently. He is interested in radio, computers, and astronomy clubs, and has taught astronomy at Rollins College and the University of Central Florida. Recently his life has been saddened because Alzheimer's forced him to place his wife in a nearby nursing home. He has four daughters, four granddaughters, and one great-granddaughter. He keeps as busy as he can.—**Carl H. Wilson**, secretary, 48 Druid Hill Rd., Newton, MA 02161-2033

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Louis "Bud" W. Pflanz writes from his Sierra Vista home: "Neither rain, nor snow, nor sleet or the dark of night supposedly will deter the mail from arriving at its destination—except from a certain Arizona town once in the heart of Apache land." Bud goes on to say he learned several letters he mailed in September never arrived, including one to his son with check enclosed. I received his letter containing some background info about **Vince Ulrick**. In addition, he is curious if one of our '35ers who stated he was the brother-in-law of **Bill Parker** of Course VI ever received his letter answering his query about long-stitch tapestry. The letter also contained several photos of his needlepoint masterpieces. So far no one has cashed his son's check.

Harold H. Everett sent photos of our 60th Reunion group to **Jack Hossfeld** and **Don Gittens**. Both replied with thank-you notes and expressed regrets that health problems kept them away. All three are planning to attend our 65th in the year 2000—"Deo Volente," as my Latin-teacher mother would say. . . . **Stanley M. Lane** writes from Helena, Mont.: "Activities are negligible—just enjoying time I have left." . . . From **Robert A. Olsen** from State College, Pa.: "All is calm, peaceful. Norma and I square dance as often as possible. I still volunteer in visiting Rockview State Correctional Institution. Been doing that for 10 years. Hope you are well." . . . **Genevieve K. Ridout** writes, "I wish I were in this generation at MIT. It looks so exciting and some of the building is great. Mine was the first class to go modern—that is passé now." . . . **J. Goffe Benson** writes from his latest home in Waccabuc, N.Y. He received a copy of the letter I wrote to all class officers requesting some class help to cover secretarial expenses, which are now being covered. But the big question is why that letter bounced around for weeks before he received it. Goffe says he is one of the non-contributors. He was a transfer student spending only his last two years at Tech. Not living in the dorms or eating at Walker, he had very limited acquaintance with others in our class. Hence no close friends and no experiences for Class Notes.

We have two more lives to celebrate in our class: **Robert G. Clarke** died on June 11, 1995; **Charles W. Smith** died October 16, 1995. Charles was a Course X man, received a master's at MIT, lived in Baton Rouge, La., and on to Rahway, then to Plainfield in 1943, where he died. He is survived by his wife, Marcella, three sons, five daughters, three sisters, and 18 grandchildren. . . . **Robert Clarke** died in Winter Haven, Fla., and is survived by his wife, Alice, two daughters, and three grandchildren. I am sending our condolences

to the surviving members.—**Allan Q. Mowatt**, secretary, 28890 Lilac Rd., #146, Valley Center, CA 92082; [new] tel: (619) 751-8611

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60th Reunion

Alice Kimball's daughter **Martha** married **Chris Detrick** on Saturday, October 28, and

they are residing in Closter, N.J., about six miles from Martha's former home. Alice reports that the foul weather of that week continued through Saturday morning, but at 3:45 p.m. the sun came out for the ceremony. So many of the Class know Martha well, from mini-reunions and other events, and there is talk of making her an honorary member of the Class. . . . **Allen Horton's** wife, **Gabriele**, and their three daughters caught the flavor of Santa Fe during the last week of September. Unfortunately, "Gabe" was bedridden at the inn several days with a severe cold, and my wife, **Phoebe**, was on crutches while fused ankle bones mended (arthritic cartilage deterioration) but they came for tea one afternoon, and we all had coffee together just before they left. Such lovely girls! Gabe reported having a summer "very busy with visitors—always stimulating for Allen. He is getting along very nicely."

Dottie and Tony Hittl made a pleasure of getting a second medical opinion last fall—by first finding friends with a similar need, and then picking a reputable clinic in Scottsdale, Ariz. When not undergoing tests, the four compared notes and enjoyed the area. Tony's recurring leg artery problem reared on a China-Alaska trip. Then, while resting at home he saw a Mayo Clinic bulletin on an experimental procedure for faster healing—bandages soaked in vinegar three times a day for two weeks at a time! We will learn at reunion how well it works. . . . A call from **Al Musschoot** two weeks after Course II-mate **Pat Patterson's** death (January issue) was also an opportunity to catch up on his activities since the August '91 report. His heavy duty vibrating and compacting equipment is now in demand around the world, accounting for 50 percent of the gross. He was about to leave for Germany, Italy, Spain, and England—his 17th Atlantic crossing last year—and business in Mexico, Japan, and Thailand is on a roll. In Germany, negotiations with Mercedes-Benz sealed a contract for compacting sand to mold aluminum engine blocks, using a new process.

In recent years a number of classmates have moved to apartments, condos, or retirement communities, as they grew less inclined to do home maintenance. The Alumni/ae office update of living classmates—undergraduate and graduate, and widows—mailed to you in November, shows all for whom current addresses and telephone numbers were known, some 380. Your class officers hope you will use the list to contact your friends and urge their attendance at our reunion. Let's make the 60th an outstanding hurrah!

Did you know that our class has a separate scholarship fund? **Alice and Treasurer Eli Grossman** had heard only some vague reference to one, but in November she was notified of the 1995-96 winner: **Damon Bramble** of Berkeley, Calif., a junior in Course II and active at MIT in community affairs, music,

and intramural sports. In 1972 some class members designated their Alumni/ae Fund contributions for a scholarship endowment. Additions were received in 1980, and the June '95 market value, including interest and dividends not yet dispersed, is \$34,400. I do not know who the fund-founders were, and would like to acknowledge their initiative and generosity. Will anyone with knowledge please write or call Class Agent Fred Assmann or me?

A note from **Martin Gilman** (Course VI-A): "We moved to a continuing-care retirement community with enticing programs, keeping us busier than ever. My three-year-old replacement aortic valve continues to work very well, so I have no restrictions except natural aging!" . . . And from **Joe Kingsbury** (Course VI, G): "Still in my home in Bethesda, Md., empty except for frequent visits from loving and lovable daughters. How do I divest the nest of a 50-year collection of memories and miscellany?"

The last canvass mailing to quiet classmates brought good returns, in time to be printed for 60th Reunion information: **Charles Rife** (Course VI-A), after nine years in engineering with GE and Bell Aircraft, turned to medicine (MD, Harvard), and ophthalmology in Mechanicsburg, Pa. Retiring in 1985, he has kept busy maintaining several buildings on his country place. . . . **Jim Souder** (Course IV and IV-B, after two years pre-med at Texas U.) designed Army health facilities in all 50 states and won the Legion of Merit in WWII service. Then he specialized in hospital architecture, with clients in 24 states and six foreign countries. He also developed new modes of housing for Puerto Rico's poor, published a book and articles, and innovated many hospital arrangements and management practices. He was consultant to the Army Surgeon General and the Colombian government. "I am ever grateful to the Institute for the makings of a joyously satisfying career, and had a great marriage." . . . **Edson Snow** (Course XV) and his wife, Edith, have known Vivian and **Mal Holcombe** since their years at MIT and Wellesley. Ed did six WWII years in the Army Signal Corps, and retired as colonel after 30 years reserve. His career in industrial engineering with Eastman Kodak spanned all this time. They will travel with their Airstream trailer to Edith's 60th, and I hope that they and the Holcombes can be at one of our luncheons at Hilton-Dedham, Cambridge, or the Museum of Science in Boston.

Adrian von Maltitz (Course XV, SM; *Technique*, page 119) returned to the Union of South Africa and earned an ScD at Stellenbosch University. In 1947 he was manager of the world's deepest mine, with 10,000 employees. From various executive and consulting positions in mining, housing, banking, and insurance, he strove to increase the price of gold from the \$35 per ounce pegged by the gold-users' cartel, with considerable success. This included worldwide marketing of Krugers. Adrian was on the Prime Minister's Economic Advisory Board, and attended meetings of the International Monetary Fund in Washington. He has a private game preserve in Botswana, which **Ralph Van Sant** (Course XV) has visited. . . . **Barney Rabin** (Course IV) is retired to Sarasota, Fla., from a specialized printing business (diplomas and badges), which he created in Marblehead, Mass. Over

the years he designed new type faces and adapted the process and general operations to computer control. His son, Paul, joined the business after degrees at UPenn and BU, and now controls the entire operation. In Kobernick House, named for a Canadian doctor who made a large grant for its construction, Barney edits a news bulletin 11 times a year for its 225 residents.

A reply from **Bill Cresswell's** (Course II) daughter **Beatrice Hartigan** reads: "Dad has been in an adult-care home since 1993. He's in reasonably good health except for chronic ulcers on both legs. Unfortunately his memory has badly deteriorated." Working initially at Lycoming Aircraft, in 1951 he became a partner at Ritmar Co., designers and producers of machine tools in Huntington, N.Y. He assumed the presidency about 1960, on buying out the other partners. Bill had a private pilot's license, and enjoyed golf and photography. His wife, Rita, died in 1976, and daughter Bea watches over him.

Cheers for the lives of **Bob Boden** and his Course VIII friend **Harold Smyth**—both PhD, **Dale Pollack** (Course VI and ScD '40), and **Wilbur Skidmore** (Course II, SM). Readers may remember that Bob Boden's many recollections were spread over two issues when I visited in 1990. During part of four graduate years he lived with fellow Dekes on Memorial Drive, from whence he could walk to classes despite a physical handicap. Two years on Stark Draper's staff, and a long career in aerospace physics and engineering, brought him in contact with numerous Tech alumni/President Compton, Charles Lindbergh, and other such. A problem solver *ne plus ultra*, including his own mobility at home and on the road as the handicap grew worse—make the word "outstanding" a minimal adjective for his life, which ended February 2, 1995. . . .

News of **Harold Smyth's** death November 24, 1994, also was belated, and less is known about him. The 1936 *Technique*, page 87, shows his residence as Lisburn, Northern Ireland, and he entered Tech with SB and SM degrees from Queens University. Directories 1961 through 1984 show him as professor in the School of Ceramics at Rutgers University, and retired thereafter. **Bob Boden** had mentioned him among several friends at Tech, and had been in touch with him at Rutgers. . . . **Dale Pollack's** widow, Ruth, returned the canvass form noted, "Dale passed away January 25, 1994. He was professor at Tuskegee University until retirement in May 1993, but was about to start teaching again at Luke Air Force Base, Ariz. He was a fellow of IEEE and listed in the 1994 *Who's Who In America*. Dale was a most unusual man, 81 years young, and a perfect husband, friend, and father." Our directories show him as president of New London Instrument Co., in 1961, and teaching at University of Negev, Israel, in 1975. Later he was a professor at Missouri and Northern Illinois Universities until 1989.

Wilbur Skidmore died August 23, 1995, at age 89, peacefully and at home in Nokomis, Fla. "Skid" was widely educated, at West Virginia Wesleyan College (BS in chemistry) then at West Point, '31, and SM in mechanical engineering at Tech after coast artillery duty stateside and in Hawaii. In the late 1930s he oversaw the placement of coastal and anti-aircraft defenses at Panama. Hence in 1939-40 **Larry Kanters** (Course XV), **Art Carota**

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(Course XVII), and **Gordon Thomas** (Course XV) had something to work with and build on when called to active duty (Oct. '88 issue). Meanwhile Skid attended Command and General Staff College, helped plan the African invasion, and saw the first landings in Morocco. Later, as anti-aircraft commander on Saipan, he watched his men down more than 20 kamikaze planes trying to wipe out the Army airfield. Skid won his Brig. General star in 1959 and retired from the Army in 1960—but went on to real estate, high school teaching of physics and chemistry, and travel. His wife, Billie, died after a long illness, and he married Carobel Heidt in 1990. Caro tells of his pride in wearing the 1936 red jacket socially. Cheers!—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501; tel: (505) 988-2745

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From Charles W. "Chuck" Dodge in Washington state: "My wife is in a nursing home with Alzheimer's. I am living in a double-wide modular home on an eight-acre lot 40

miles from the nearest city. I keep busy fixing up and maintaining my property and learning how to cope with Windows and the Internet. In my spare time, I am doing an in-depth Bible study for which my computer is a tremendous tool." . . . **D.O. "Woody" Wood** writes about his many travels in Turkey, Switzerland, S. Korea, and S. Africa. He is doing consulting and marketing of a telecommunications product and keeps up with the aerospace industry by attending the air shows in Paris and Farnborough. Unwinding between trips means more travel—visiting his daughters' families in Santa Barbara and Washington, D.C. When time permits, he indulges in his hobbies: hi-fi, photography, reading, and some local charity work. . . . **Ed Bartholomew** of Marion, Mass., who will probably be in Tucson, Ariz., by the time he reads this, tells of harvesting the cranberries at his place last fall. He says: "It was not as good as last year, but we will make operating expenses, and it provides the opportunity for involvement." He cherishes such activities as the basis for health and happiness. With his wife, Sara, he gets great enjoyment from occasions when they join with their family of 16. He sends best wishes to all of his classmates.

Did you ever have a "right leg year?" That's what **Roger Wingate** and his wife, Skipper, had last year. He says: "We went for a vacation on PEI Canada. The second night, Skipper fell and broke her ankle and is still getting over it. Then I was bitten by a poisonous spider, which caused my right leg to swell to twice its size, bright red. It took six weeks to recover!" But he feels that, aside from this episode, they have been most fortunate, healthwise. Roger is very active in their neighboring New Hampshire towns near Mirror Lake. He has been chairman of the NH Medical Malpractice group, moderator of the town of Tuftonboro, on the executive committee of Huggins Hospital, and active in several other organizations. He plans to attend the reunion in 1997. How about you?

In last year's November/December Class Notes, we told of the honor bestowed on **Ralph Chapin** for re-invigorating the 111-year-old business created by his grandfather.

His recent response: "It has been a tough five years!" . . . A much-too-brief note from **D.F. Tuttle** says that he is still living at Stanford and is still moderately active "but only moderately." . . . **Art Zimmerman** now lives in Port Washington, Wis., 25 miles north of Milwaukee, where he and Agnes moved to be near their daughter, a 20-year resident. He complains that "the MIT organization here is non-existent. While there are about 100 names listed in the latest MIT alumni/ae directory for Milwaukee and environs, the only communication I have received is one from the Chicago chapter, but that is too far to drive to attend a meeting." Art tried to respond to our request for information on **Jonathan B. Cobb**, whose passing we reported last December, but was unable to find a trace. Does anyone have such information?

There's more on the life of classmate **Bill Burnet**, who died in February of 1985. After graduation, Bill worked as an engineer at Superior Separator, a Minneapolis firm specializing in food-processing equipment. He later moved to Strong Scott Manufacturing Co., also involved in food-processing equipment, and rose to the level of VP. After 10 years, he went out on his own, founding Dynaquip Corp. in 1965. There he developed a number of food processing machines, notably a fluidizer to blend food products. He retired in 1975, but in 1973 he invested, with three other friends, in his son Ralph's real estate business. It grew into one of Minnesota's largest and was sold in 1982 to Merrill Lynch. Ralph became chairman of a financial company. Bill is survived by his wife, Patricia, a son, two sisters, and three daughters.

We regret to report the death of **Philip Bliss** of Newington, Conn., in October 1985. According to the *Hartford Courant*, Phil worked as an instrumentation project engineer for Pratt & Whitney Aircraft for 29 years, retiring but remaining active in his field. His expertise was in temperature measurement and he led efforts to establish industry-wide standards. In 1975, Phil was selected to receive the Award of Merit from ASTM, in which he was elected a Fellow, "in recognition for his outstanding contributions to the advancement of voluntary standardization." He was a longtime member of the Instrumentation Society of America (ISA), from whom he received the ISA Standards and Practices Award in 1979. He was also a life senior member of the Institute of Electrical and Electronics Engineers. Outside of his professional accomplishments, Phil was an active member of the Church of Christ, Congregational, Newington, serving as deacon for many years. Belatedly, we express our regrets to his family.—Co-secretaries: **Leonard A. Seder**, 1010 Waltham St., B345, Lexington, MA 02173; **Robert H. Thorson**, 66 Swan Rd., Winchester, MA 01890

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Be on the lookout for **Homer R. Oldfield's** new book! He writes from Bradenton, Fla., that "having completed a career both as an engineer and a business manager, I decided

to embark on a completely different career as an author. A couple of unwanted and unpublished novels still grace my filing cabinet, but I recently made my first sale. The IEEE Com-

puter Society Press is publishing my book, *King of the Seven Dwarves*, to be issued in April 1996. It's a nonfiction adventure story of General Electric's ambiguous challenge to IBM during the dawn of the computer industry."

Robert D. Solomon, who was adjunct professor in Course VII in 1938, writes from Hampstead on the coast of North Carolina: "Now that I am unable to do lab work myself, I read of the marvels being discovered daily by others. I peruse 25 journals and as many review volumes. It is a great joy to have been at the origin of molecular biology and to have watched it develop. It would help if my memoir banks were larger."

In 1995 we received thank you letters from some of the recipients of Class of 1938 scholarships. There is not enough room to quote the full letters but the tenor may be gained from excerpts. Annia Yiu, who is studying to be a mechanical engineer, writes, "Today I am here at MIT because I am under full financial coverage. I work about 12 hours a week for spending money. I try to cook for myself to save money. I have gotten a chance to play intramural soccer, basketball, and baseball. I am involved in cultural clubs—the Chinese Student Club and Association of Taiwanese Students—as well as an academic club, Society of Women Engineers. I have also been active in community service events."

Rosanne Rouf was born in the Midwest and raised in a small town near St. Louis, Mo. Her parents immigrated here from Bangladesh in 1974. She writes, "And here I am, with the help of scholarships such as yours. I am avidly pursuing an electrical engineering degree with a minor in biomedical engineering and chemistry. I love MIT, and I find it extremely challenging and enjoyable. The education I receive here really pushes me to my limits. I enjoy my classes and I am excited to start my thesis this fall. Extracurricularly, I have found a niche in a peer theater group that performs skits about rape and alcohol in the campus dorms and living groups. I am also cultural director of the South Asian Students Association. I volunteer in the Cambridge schools during the school year and absolutely love teaching children."

Did you know that in addition to the regular Class of 1938 scholarships there are two Class of 1938 Beta Theta Pi Scholarship awards? Last year Kevin Frye from Eliot, Maine, and Wesley Williams of Apopka, Fla., were the recipients.

Ed Hadley is busy with the arrangements for our 1996 mini-reunion, which is scheduled for Friday, June 7, at the Wyndham Garden Hotel, 477 Totten Pond Rd., in Waltham, Mass. He will be sending you the details.—**Paul R. Des Jardins**, secretary, 6251 Old Dominion Dr., Apt. 310, McLean, VA 22101-4807; tel: (703) 534-4813; **G. Edwin Hadley**, mini-reunion chairman, 50 Spofford Rd., Boxford, MA 01921-1504; tel: (508) 352-6040

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MIT published "The Report of The President, Charles M. Vest, for the academic year 1994-1995." Its 16 pages are packed with accomplishments and statistical facts. Com-

ments about MIT's policies and forward goals are set in perspective of scientists' quests over centuries to extend the thresholds of human

knowledge. Grants and bequests to MIT from private donors totaled \$108.7 million. (Note: while many of you have designated bequests to MIT, others might like to know that **Ernie Kaswell** and **Len Mautner** are able and willing to explain ways and means to do so. Ernie and Len are dedicated to helping '39ers help MIT.)

In the report President Vest eloquently enumerates 36 major areas that perplex humans on Earth now. In those areas young scientists will find their careers and earn their achievements. Careful reading of Vest's whole report is strongly recommended. In their retirements, '39ers might initiate new efforts to assemble high school students in their neighborhoods and, with friends from other universities, conduct a series of seminars to explain the 36 areas. The high schoolers could be stimulated to widen their views about challenges ahead.

Walter Mays and **Hazel** boarded the *Queen Elizabeth II* and revisited England for three days. They went through the Chunnel (under the English Channel) to Paris and came home via the Concorde. Walter writes: "The Eurostar train trip from London to Paris took three hours with approximately 20 minutes of that time in the Chunnel. The speed of the train in England is relatively low since a new roadbed remains to be constructed. But on the French side, the cruising speed of 185 mph is quickly reached. The supersonic ride on the Concorde was Hazel's first time, and she enjoyed all aspects. When we landed in New York, the clocks indicated about two hours earlier than when we left Paris." . . . **Francis Recka** is active in the U.S. Coast Guard Auxiliary. He is completing a second tour as commander of Harwich Flotilla. Also, he works a day per week as communications watchstander at the U.S. Coast Guard station in Provincetown, Mass. He listens to boating activity via VHF antenna atop Pilgrim Monument, 350 feet high. Also, Francis spent five days as assistant lighthouse keeper at Boston Light.

The **Len Mautners** completed a tour of the Middle East, including Greece, Haifa, and Jerusalem in Israel, and Amman, Aquaba, and Petra in Jordan. Now safely at home in Pacific Palisades, Calif., Len is volunteering his expertise in estate planning and in charitable remainder trusts. For help, phone (310) 454-3422. . . . **Bill Pulver** and **Adie** tell a big story about a little dog playing piano in a bar. Also, Bill nominated to Allen Gottlieb, editor of the *Review* Puzzle Corner, this problem: "What 16-digit number, when multiplied by an single digit, gives a product containing the same 16 digits?" To correspond about details, and maybe even learn about the piano-laying dog, write Bill at Box 716, Lakeville, CT 06039-1411. . . . **Bob Schmucker** received a November 13 report from Bill Pulver, whose doctor said he would get well. During undergraduate days, Bob was general manager of the MIT Musical Club. During the last 50 years he enjoyed playing on his Mittenwald Nuremburg violin, but now he has become willing to sell it for its appraised value.

When the President of the MIT Club of Minnesota moved to Russia, Professor Emeritus **Morris E. Nicholson** was invited to assume leadership of the club. With **Bob Blake** and **Dick Christie**, he developed a survey form, sent it to several hundred alumni/ae in Minnesota, and received 100 replies. At a November meeting, new officers and a seven-member program committee were elected.

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Morrie serves as chairman of the board and Dick as a board member. . . . Dick Christie and Barbara accommodated repair to Dick's pacemaker before cruising on the Love Boat through the Panama Canal. Then they made a safari before visiting in Capetown and Johannesburg. . . . **Gus Griffin** and Elizabeth flew to Sidney, Australia, where Gus presented a technical paper to the Australian Institute of Metal Finishers. After visiting their musician son and musician daughter-in-law in London, Gus and Elizabeth expect to be in Johannesburg to discuss Gus' new process to recover chromium.

Ben Badenoch and Gay are retired in Walnut Creek, Calif. Ben excelled in sport gliding. Some years ago, he won championship of a weeklong glider meet in central California. The contestants flew every day for between two and five hours. Gliders were towed to 2,000 feet and released. Gliders were maneuvered to 5,000 feet and, when location of the glider was confirmed, the pilots flew a multi-leg course. The object was to take the least time, all week, for all the courses. Ben's total times earned the championship and a handsome trophy. . . . **Bea Peskoe**, cofounder of a 850-student grade school named after Beatrice and **Irving Peskoe**, writes: "I'm going through my *Technology Reviews*. I clip the alumni/ae notes. Then I take the magazines to local high schools where librarians offer them for research to the really bright kids. Very valuable." . . . **Dodie Casselman** and **Don Grison** did two Elderhostels—England with southern Scotland and Williamsburg.

Henry C. Littlejohn writes: "I am volunteer teaching 4th and 5th grades in Severna Park, Md. I teach math, science, geography, geology, and anatomy. Great fun with the kids." . . . Class President **Manning Morrill** and **Connie** offered to sell their lovely home in Arlington, Mass., and they have in mind the Condo they'll furnish with a very-small-half of what they use in Arlington. . . . **George Beesley** and **Eleanor** report pleasure with their accommodations at Exeter, N.H. **Don Severance**, '38, and **Phyllis** live nearby.

John Alexander and **Nancy** are moving into a new condominium on the shore of Mercer Island in Lake Washington. John is optimizing design of propellers used in small boats, and **Nancy** is preparing for her annual giftings to society in the form of helping senior citizens with their tax declarations. . . . **Woody Baldwin** retired from astrodynamics work at Aerospace Corp. He races a 14-foot sailboat and plays flute in orchestra. He quit fencing and signed up for ballet class, which the secretary says is a far cry from being on MIT's boxing team during undergraduate years. . . . **Barry Graham** and **Wendy** left Toronto's winter for a vacation in Costa Rica. Maybe they'll meet **Chris Rosas Figueroa** who has resided in Costa Rica for years. . . . **Gus Hunicke** and **Peggy** are leaving Connecticut's snows for a few months closer to the equator. . . . The **Arthur Zeldins** toured Switzerland, played golf, did financial consulting, and are planning trips to the Caribbean, Salt Lake City, Kansas City, New York, and Asheville, N.C.

We are saddened by report of the death on July 29, 1995, of **James Westwood Greely**. There were no details.—**Harold R. Seykota**, secretary, 2853 Claremont Dr., Tacoma, WA 98407-2332

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Recently, I received an up-to-date class roster from the Alumni/ae Office, and was chagrined to see how much thinner it was than the last one. In spite of the fact that obits are reported in the column when received, it was still a shock to see how our membership is decreasing.

With the regular notice of deadline date for publication, *Technology Review* sent a number of notes they had received from classmates: **Charles A. "Andy" Stokes**, who received a master's in chemical engineering practice with our class and an ScD in 1951, writes from Naples, Fla., "Retiring as chairman of the Florida Engineering Society Statewide Energy Committee after many years of service. I will remain on the committee as vice-chairman." . . . From Silver Spring, Md., **Roland Daudelin** notes that he retired in January 1979. . . . **Robert McKinley** of Hancock, N.H., writes that he was honored in June 1995 by a reunion of former employees, he was recognized by **Jimmy Carter** as a "fellow poet," and he was recovered after "roto-rooting" of his prostate.

Judson Rhode, who lives in Ponte Vedra Beach, Fla., writes, "The older I get, the further south I want to go. Florida is too far from Cambridge to be able to drop in for the annual reunions, and St. Croix—where my new wife (**Vi Elliott Rhode**) and I are spending more time each year—is even further. The hurricanes brought us back to Ponte Vedra in early September. We're safe, but the condo suffered some water damage from Marilyn." . . . **Daniel Puffer** of North Andover, Mass., apologizes for the delay in writing, but he was tied up with cataract surgery in both eyes in one month. It all turned out fine.

From Larchmont, N.Y., **Lee Bloom** writes, "As active members of the United Nations Association of the USA since 1957, 1995 has been a busy year for **Mary Lou** and me. We were in San Francisco for the 50th anniversary of the signing of the U.N. Charter, and have been much involved in events in Westchester and New York City. Another 50th anniversary is of our wedding, which occurred on December 15, 1945. I serve on the local Human Rights Commission, am chair of the Larchmont Reservoir Conservancy, and am mentoring a fifth grade genius at a local school."

Paul Olaf Jensen passed away in Quincy, Mass., on September 16, 1995. He joined the Army in 1941 and served in the Corps of Engineers, building aircraft runways under enemy fire in the South Pacific. Paul was the former owner of Broadway Tire and Battery in South Boston, and past president of the Statewide Towing Association. He was a member of Wollaston Lodge of AF & AM, York Rite Bodies, and Aleppo Temple Shrine. . . . A letter from Mrs. **James W. Barton** (her husband was class of '39) reports the death of **Jacob A. "Jack" Samuelson** in Seattle, Wash., on October 23, 1995. Jack received an SM with our class. During WWII, he worked at Todd Pacific Shipyards, and was associated with General Construction Co. for 22 years. He and **Jim Barton** were on the MIT Educational Council and worked together for many years. Jack was very civic minded and contributed much to Seattle. . . . There is also word from **Dick Babish** that **Norman Davis** of East Falmouth, Mass., died in August 1995.

There is no further information. The class sends its condolences to the families of these classmates.

Class of '41 member **Ivor Collins** sent me a clipping from the fall 1995 edition of *Footnotes*, a quarterly newspaper for members of RRCA clubs, with a letter to the editor from **Alvin Gutttag**. The letter extols the virtues of **Oscar Hedlund**, who coached at MIT from 1924 until 1960, and continues with Al's nostalgic picture of Hedlund.

Treasurer **Richard Babish** sent me some of the letters that came to him along with class dues. I shall quote from them in future columns. In a letter of his own, he writes, "Response to the start of a new five-year-period has been excellent. To date (November 25, 1995), 94 people have responded with a total of \$1,290, meaning that many are prepaying the whole five years dues at once. The mood is optimistic looking forward to the magic year 2000! **John McKee** 'hopes to see 2000' and draws a smiling face to back it up. **Harvey Brown** suggests, 'This should take care of the current millennium.' Others, more resigned to the inevitable, nonetheless express the hope to see the day."

Dick continues, "Health is becoming more of a problem. Our most stalwart exemplars, **Ray Keyes** and **Barry Taft** still stand firm against adversity, and **Marshall McCuen** regrets he has been unable to make the last two reunions. Perhaps the 'Committees of Correspondence' might be able to slant things in a way to keep them current and involved more. **Wally Schuchard**'s correspondence effort had an initial response from several dependable classmates. Some entrepreneurs are still active: **Edmund DiGiannantonio** 'Digi' is selling old recordings, and **Willard Morrison, Jr.**, is selling advanced heating systems."

Your letters and calls are the fuel for the column. Keep them coming.—**Richard E. Gladstone**, secretary, 250 Hammond Pond Pkwy., 1205 S, Chestnut Hill, MA 02167-1528; tel: (617) 969-5161

41 55th Reunion

Frank Wyle writes: "I've had a very low profile insofar as Class Notes are concerned, and have decided to enter the fray and report the news of the Wyle family. We have three children and eight grandchildren, all it seems pursuing different sorts of interests and careers. The oldest granddaughter, **Alex**, is at the University of California at Davis, finishing her degree in veterinarian medicine with an eye on a career in big animal surgery. Another granddaughter, **Joanna** is in Barcelona getting a master's in art. A grandson **Noah Wyle** is the current heartthrob, **Dr. Carter**, on the TV hit series *ER*. Granddaughter **Rosie** is an artist and interested in dance choreography. Another granddaughter is living in Hawaii, and two more have not reached college age. An interesting event occurred at Wyle Laboratories, the company I founded in 1949. The company has two areas of business; one, the Electronics Distribution Company, and the second, the Scientific, Services, and Systems Group, which operates in the aerospace testing and nuclear field. Management decided to divest itself of the SS&S Group, which consisted of 820

employees, with over half having engineering or scientific degrees.

"My son, Stephen, organized a \$30 million, leveraged buyout of this group, backed by the William Simons Company. This, to me, is the best of all possible worlds, as Stephen, who now heads the company as chairman and CEO, was able to make the transition without losing any employees. He retained the name Wyle Laboratories and the parent company changed its name to Wyle Electronics. This also proved a very good move for the parent, which is now operating at a billion dollar rate. I've been retired for about 11 years, but maintain an office at Wyle Laboratories, which keeps me off the street! A good portion of our lives is spent at our ranch, between Fresno and Yosemite, where we principally raise cattle. I also have a small factory where we can produce most any product, but our principal product is a cooking machine. I would be happy to send a seven-minute tape and brochure that expounds its virtues to any who are curious. We are currently having a problem with a renegade bear who seems to want to break into houses, and a mountain lion who is killing calves. but that is part of the price you pay for beauty in the Sierra foothills. My wife, Edith, and I get to the ranch almost every other weekend, and it is a common meeting area as our kids each have a house there. It's also been a wonderful influence on the grandchildren."

The Alumni/ae Association informs us that two of our classmates have passed away: **Gilman Blake Andrews** died of cardiac failure following heart surgery in Pasadena, Calif., on June 29, 1995. He was born in Augusta, Maine, on November 23, 1916. He prepared for MIT at Needham High School and Huntington School for Boys in Massachusetts. At MIT he obtained an SB degree in Course VI, electrical engineering communications, and was a member of AIEE, Hobby Shop, and the Commuters Club. He worked at Sperry Gyroscope in Long Island, N.Y., and then at Bendix Aviation Corp Detroit, Mich., retiring as director of Technology Utilization. From 1985 to 1991 he was manager of the Power Electronics Group at the California Institute of Technology before re-retiring. He leaves his wife, Cora, a son, two daughters, five granddaughters, and two great-grandsons. He was predeceased by another son. Cora continues to reside at 954 Topeka St., Pasadena, CA 91104. . . . **Francis Xavier Amsler**, Course XIX, died unexpectedly on October 15, 1994. He was a WWII U.S. Army Air Corps veteran, and retired deputy superintendent of the M.D.C. Police Department. Frank must hold at least one class record, having listed 325 Bellvue St., West Roxbury, MA 02132-6441, as his address in Tech documents since at least 1948. Besides his wife, Mary, of this address, he leaves two daughters, two sons, and four grandchildren. The class extends its sympathy to the families of these departed classmates.

Robert Wilson Blake, updating my November/December '95 column reports: "George White, ninth architect of the Capitol, was given a great birthday party on the occasion of his 75th birthday and retirement after 25 years at his post. The grand affair, done in style, featured accolades from Senator Daniel Patrick Moynihan, Justice Sandra Day O'Connor, J. Carter Brown, and others. Daughter Jocelyn White gave an endearing tribute. Waiters with

birthday cakes marched in, candles (75, count 'em) galore, and we sang a rousing rendition of 'Happy Birthday to You!' The scene was in the hall of the National Building Museum, one of the most spectacular rooms in Washington, if not the country. Place cards seated me next to a couple of old '41ers, **Roger Robertson**, his wife, and **Jim Pickard**. Guests at our table, all septuagenarians, had known George for many years; for me, elementary, junior, and senior high school, and dear old Tech (2nd to 16th grade!)." . . . By now everyone must have had several mailings describing the great program of our 55th Reunion at Tech and Martha's Vineyard (June 6-11). I hope you are all planning to attend. At last count, December 1, 30 classmates (60 with wives and other guests) had signed up with more registrations coming in every day. Send in your registration now! See you all there!—**Charles. H. King, Jr.**, secretary, 7509 Sebago Rd., Bethesda, MD 20817-4839; e-mail: <olspaceman@aol.com>

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Jane and George Toumanoff are moving from Hancock, N.H., to the Rivermead Retirement Community and we wish them good fortune in their new lifestyle. . . . **Dan**

Schaeffer met with **Lou Rosenblum** and **Bill Denhard** at the recent MIT Leadership Conference but sent no further news. . . . **Fran Karlan** and spouse have been retired for a few years. They did a lot of traveling and are now settled down to day trips and playing with their computer.

Robert Wilson is still golfing three times weekly despite osteoarthritis in his back, shoulders, hips, and knees. He's living in St. Charles, Iowa. . . . **Andy Skinner** enjoys life as ship superintendent on his *Bermuda 40*. He extends an invitation to one and all to come aboard for a cruise in Maine. . . . **J.J. Quinn** was honored at The Gathering of Eagles for test piloting at Edwards Air Force Base in the 1950s. Others at the event included **Chuck Yeager**. Looks as though J.J. is keeping pretty good company these days!

Mario Molina who holds the Lee and Geraldine Martin Professorship has received a Nobel prize so we can all take pride in this. . . . **Bob Greenes** is chairman of the Scarsdale Real Estate Review Board and is still leading tours of oil industry executives to Israel. . . . After a 48-year association, **Harvey Kram** has retired as group VP of Leviton and will be associated with the company as executive consultant. He and Elly have moved to Tamarac, Fla.

Three obits: **Vincent Elkind** in Virginia. He was a chemist with the Ideal Plating and Polishing Co. in Bellville for 24 years; **Robert Frost**, VP of Adams Frost Associates in South Dartmouth, Mass.; and **Arie Van Teylingen** in Bozeman, Mont. Our condolences to all their families.—**Ken Rosett**, secretary, 2222 Americus Blvd., North, Apt. 12, Clearwater, FL 34623

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The editor's note on my column in the January Class Notes was my first information about the serious illnesses of **Marge** and **Chris Matthew** late last summer. Chris has had a miraculous recovery from an aneurysm

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near the heart and a massive blood clot in his leg, while Marge's pneumonia responded well to antibiotics. As of late December, they were getting around a bit but still staying fairly close to home. Cards and calls are always appropriate.

Peter Gratiot in Woodstock, Vt., and **Gus Root**, Falmouth, Maine, are both entering the arena on behalf of education. Pete writes: "Retired from consulting engineering. Trying to reform public education finance in Vermont. In third year of work on biography of ancestor Charles Gratiot, 1754-1817." Says Gus: "Didn't run for reelection to Town Council so I could concentrate on volunteering in the transformation of our school system to become a 'learning organization based on system dynamics principles.' It's fun being retired and busy."

Dick Feingold, in his usual modest fashion, has sent news about some classmates but next to none about himself and friend Betty. Dick and Betty visited in November with Pat and **Bruce Horst**, who have businesses in Rockford, Ill., and a condo in Naples, Fla. Pat's P.J. Maxwell Co. markets an environmentally safe insect repellent using skin patches, and plastic salad tossers of an advanced design.

Chuck Lawson is also retired in Naples, occupying a condo only a few hundred feet from Bruce's. Chuck and Bruce sometimes get together with Chuck's brother Tom, '44, and reminisce about father Charles Lawson, '20, who also had a winter home in Naples when it was a small fishing village. . . . **Greg Gagarin**, offspring of Russian royalty who fled the Bolshevik revolution, has been rehabilitated in the old homeland. Under the new regime, when Greg visits Russia they welcome him with a limousine at the airport and other VIP treatment. Greg has been acting here in the States as a liaison for other Americans with similar Russian heritage.

Forgive me, Dick for editing your deathless prose. Paper is expensive and space is at a premium. I appreciate your suggestion that I transmit the column by e-mail, but I have barely mastered the technology of the Pony Express.—**Bob Rorschach**, secretary, 4727 S. Lewis Pl., Tulsa, OK 74105-5138

44

Several classmates sent notes for this month's column. **Wilson Gilliat** writes that he and Mary celebrated their 50th wedding anniversary with a Mediterranean cruise follow-

ing our 50th Reunion. Congratulations to you both. This fall they toured New England and stopped at Rockport where he recalls, with pleasure, marching in the 1994 Memorial Day parade alongside many classmates dressed in our "Redcoats." He says that Pensacola is a great place to retire!

After retirement from the aerospace industry, **Paul Kase** keeps active as a Volunteer for Science at the U.S. Geological Survey. He programs personal computers for water-exploration projects. . . . **Andy Margileth** is also active, as a pediatrician at the Volunteers in Medicine Clinic. This is a free clinic for the indigent at Hilton Head Island, S.C. He is also pleased with his retirement home. . . . From Round Pond, Maine, we heard from **Will Rodeman**. He and Emily missed connections with Dot and **Walt Turner** in June but did

meet them at Orono in the fall. Will also writes of visiting **Jeane** and **Holton Harris** in Connecticut but was unable to entice them to the rugged climes of Maine.

Larry Varnerin called and sadly reported the death of brother-in-law **Joseph M. Donahue**, on November 28, 1995. Joe graduated from Course XV in June 1947 after service in the Army. After several years in the rubber industry, Joe changed professions and received a DMD from Tufts in 1967. He then established a long and successful practice in his hometown, Milton. Joe was active in civic affairs and served many years on the school committee and many more years as a town meeting member. Joe and Jean were at our 50th Reunion. Our condolences go to Jean, children Martha, Virginia, Joseph Jr., Robert, Maria, and Lawrence, and 12 grandchildren.

We have a newspaper clipping about **Reg Robba**, Course XIII. This was sent in by **Tom Bell**. Both graduated in 1947 but were members of the original '45 class, though Tom is associated with '47. Both live on the Maryland eastern peninsula. The news is about Reg's work on the Manhattan project at Oak Ridge from June 1944 until February 1946.

Reg enlisted in the Army Reserves and was assigned to the ASTP. He received technical training at Lehigh University. At Oak Ridge, his main duty was in the separation of uranium 235 from natural uranium. Regarding the sentiments about their work and consequences, Reg had this to say: "It was exciting working at Oak Ridge. The thought of not using the bomb never entered our minds. There was never any discussion of that. We thought this was a great weapon and a tremendous opportunity to end the war. We were trying to win a war. We helped bring a difficult world conflict to an end." About the atomic bomb during the cold war, Reg said: "But the nuclear device also served as a deterrent. The Russians never had to wonder whether or not we would drop a bomb. We already had."

Today, Reg still works part-time for Johns Hopkins, where he was a lecturer and researcher at the applied physics lab.

In October 1994, **Jane** and **Lou Demarkles** went to Switzerland on an MIT Alumni/ae Travel Program trip. Their enthusiastic recommendation prompted Rose and I to participate in the repeat program in September 1995. It exceeded our expectations not only in the pleasures of the program, but it became a micro reunion. Also on the trip were Dot and **JB Gardner** and **George Saulnier**. Our class was 25 percent of the group.

For the entire week of the program, we stayed at the Sherlock Holmes Hotel in Meiringen. Day trips by bus and train were made to nearby attractions. There were short lectures about the Swiss government, the languages, the cultures, the educational system, and the architecture of the buildings. The lecturer was **Larry Matson** and the tour leader was **Sara Tattersall**, ably aided by **Madeleine Thoni**. Larry and Madeleine are transplanted Americans, while Sara is from Wales.

Some of the attractions were the **Rosenlaui Gorge** and glacier, the **Reichenbach Falls** (of Sherlock Homes and Prof. Moriarty fame), the **Ballenberg living history museum**, the cog-wheel train up to the **Rothhorn**, as well as visits to **Luzern** and **Brienz** where the woodcarving center is located. We even visited the

locomotive shop of the **Rothornbahn**. There were four or five steam locomotives under maintenance.

On the one day off, Rose and I accompanied Dot and JB on a four-mile hike from **Grosse Scheidegg** to **First**, where we rode the gondola down to **Grindelwald**.

In spite of the damp weather during our week there, it was an enjoyable experience. For us gray heads, the program had extra appeal because of the practical logistics of staying in one hotel, the educational aspects, the natural attractions, and the all-inclusive pricing.—Co-secretaries: **Louis R. Demarkles**, 77 Circuit Ave., Hyannis, MA 02601; **Frank K. Chin**, 221 St. Paul St., Brookline, MA 02146

45

'Tis the week before Christmas and is it ever white here in New England. To think that we had to shovel this stuff in our youth; thank you for snow blowers. Easter will

be upon us as you read these notes, hopefully the mud season will have passed.

You all continue to be far too complimentary as respects our 50th Reunion celebration. On behalf of the Committee, I again thank you and please keep those wonderful photos coming. Treasurer **Jim Pickel** submitted a report to **Prexy Bob Maglathlin** on November 19 indicating that our reunion was a break-even proposition.

Our 50th was a \$31,500 operation with income divided as follows: dues \$7,000, credit cards \$13,500, checks and interest \$11,000. Expenses were divided in all sorts of ways; details will be provided on demand—registered mail return receipt requested. One must add to the foregoing figures \$7,000 received from the Alumni/ae Association as an offset to our Reunion Book expense.

Speaking of our 50th Reunion Book, should any of you have received an extra book please return; the book is out of print and the demand continues. Captain **Vince Butler**, USNR ret., is acting as our clearing house; he advises that **J.J. Strnad** has three copies but we don't believe it.

Libby and **Jerry Patterson** celebrated their 50th wedding anniversary (November 3, 1945—the day after many of us graduated from Midshipmen's school) with a trip to Ireland, Great Britain, and gay Paris. The family celebration took place on Thanksgiving when all the children and grandchildren descended upon Midlothian, Tex. . . . **Pete Hickey** is in as good health as I have seen him in several years. I am at a loss as to whether it is the good care he receives from all the Medicare services or the 50-year ritual of Sunday family daiquiris—more than likely the latter!

A special thank you to **Emmett Day** of Seattle for the wide-vision photos of our commencement procession; most of you are recognizable! . . . Following reunion the **Kirk Drumhellers** had a relaxing time in Nova Scotia as Kirk tried to find a particular McIver ancestor. To quote Kirk, "trying to find a particular McIver in Nova Scotia is like trying to find a particular Smith in the U.S.!" A trip to the Northwest is on our horizon, Drumhellers.

Bob Lohman of Rockville, Md., reports that both he and Kate missed their 50th Reunion at Radcliffe and MIT because they celebrated

Kate's 70th birthday near her old home in England and then went touring for six weeks in Europe. Bob reports that this was his 48th trip to Europe. Can any of you top that? In his spare moments Bob is putting in his 15th year as a docent at the National Air and Space Museum.

A nice note from Al Bowen wherein he asked that Charlie Patterson be thanked for comparing him and his collegiate rowing to Jack Kelly. In his semi-retirement Al is consulting full time for a Cranford, N.J., law firm—a 69-mile one-way commute by car on greater New York highways. The activity involved Al's expertise in project freight forwarding ranging from ocean carrier to the building and expansion of oil refineries. I trust his bridge playing has not suffered!

President Bob Maglathlin's wife Ann slipped, fell, and broke her left hip in late September while walking through the hallway of their Wareham cottage carrying groceries. The doctors at Brigham and Women's put her back together again and all is well. Well, almost, as Bob has an added physical problem of his advancing years: dishpan hands!

In mid-October Don Severance, '38, wrote to Bob as follows: "Many thanks for the inscribed copy of your 50th Reunion Book. We have just returned from three weeks in the U.K. I'd be well along on catching up with accumulated desk work if I hadn't spent so much time with your book. I think I know more members of your class than any class except my own. What a flood of memories: gruff Captain Joyce; the classics professor turned Naval officer—Curt Canfield; Willie Jackson who embarrassed the President's office (Compton—not Roosevelt!) by taking it upon himself to invite the Prince of Wales to MIT. Some great memories."

That's it for now. I think I'll go enjoy one of Pete Hickey's daiquiris. See you next month.—Clinton H. Springer, secretary, P.O. Box 288, New Castle, NH 03854

46 50th Reunion

In preparation for our 50th Reunion in June 1996, we had an informal party in December 1995 at the MIT Faculty Club. Eleven class members attended including Lou Barber, John Gunnarson, John Harvell, Ted Heuchling, Gus Krenkel, Bob Neal, Bill Semple, Clif Sibley, Bob Spoerl, Ned Tebbets, and Jim Waters. Several wives also attended. There was a lot of enthusiasm anticipating our stay on campus June 6–9, 1996, and our stay in Newport, R.I., from June 9–11.

Jim Finney of Riverside, Conn., reports that last August he and Daphne went on an Arctic special expedition and got to 80 degrees north latitude. They visited Spitzbergen, Greenland, and Iceland. En route they ran into Hurricane Felix. . . . Lewis Mann is living in Fresno, Calif., and after retiring in 1994 he went back to work instructing chemistry at a local community college. The teaching pay covers gas for his car, parking fees, and a small supply of beer to calm his nerves after driving California Highway 99.

Sam Meerbaum of Woodland Hills, Calif., reports on his creative retirement involving visits to national parks, Switzerland, the Czech

Republic, and France. He is updating book chapters dealing with diagnostic and interventional cardiology. He is also researching several aspects of the WWII Holocaust, including the Theresienstadt Concentration Camp, and the courageous actions in Hungary of Raoul Wallenberg. . . . Pauline V. Teague of Ocean-side, Calif., is still enjoying good health and international travels to Iceland, Greenland, and Australia. She wants more news from the Class of 1946 coeds. . . . Bob White and his wife, Barbara, will celebrate their 50th wedding anniversary on February 25, 1996. They have built a new home in South Harpswell, Maine, on Casco Bay. Bob has a lot of family roots in that area. They have five children. They are both in good health and are both active in many local community organizations.—Ned Tebbets, secretary, 9 Jerusalem Road Dr., Cohasset, MA 02025-1100; tel: (617) 383-1662

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Lee Schwarz sends us a report on his "third childhood." His second childhood included motorcycles and an experimental aircraft. Now he's learning to fly a powered glider! He also continues to do some volunteer consulting in Israel and Mexico on "continuous improvement." He and Marge continue to be in excellent health. . . . Claude Brenner was appointed to the MIT Council for the Arts this year. . . . Bernie Palitz has been on the council since 1978, chairs its membership committee, and serves on the MIT Museum Advisory Council.

Harl Aldrich has finished a major project he's been working on for three years, since he retired. He's written a book, *A Branch of the Aldrich Family in the Americas*. It starts with George Aldrich's arrival in the Colonies from England in 1631! The book will be published by the time this column is printed. . . . Fred Ehrlich retired from GE Aircraft Engines in December 1993 after 42 years in the industry, the last 36 with GE. He remains very active with some consulting, professional society work, lectures, seminars, and a part-time appointment as senior lecturer at the MIT Gas Turbine Lab. He's also busy with family activities—three children, two grandchildren. He'll be at our 50th in 1997.

Don Kornreich writes from Incline Village, Nev. He retired from the U.S. Dept. of Transportation seven years ago and has been busy in environmental activities in the Lake Tahoe area since then—along with golf, tennis, skiing, hiking, and trail building. . . . Brief note from John Yocum. He's still consulting in environmental engineering and works occasionally with Ed Kane.

John Karmazin passed away in October. He was an active supporter of MIT and, in fact, attended the Sustaining Fellows Program in May at the Institute. He was chairman and president of Karmazin Products in Detroit. He is survived by his wife, Sandra.

Phil Solomon succumbed to leukemia in September. Phil was a Course XVI graduate who taught aeronautical engineering at Boston University for several years after graduation and then made a total career change. He became a flight engineer with TWA and later, when the industry agreed that all cockpit crew be pilot trained, he qualified to fly jets. On his

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last flight before he retired, he flew a 747 from London to St. Louis. He is survived by his wife, Fran. They were both at our 45th Reunion in 1992.

Stanley Kordys, MD, died in September. He attended the Bologna University Medical School in Bologna, Italy, after graduation from MIT and was an orthopedic surgeon in Dover, N.J., until retirement a few years ago. He is survived by two brothers and two sisters.

Personal note. Last summer Ann and I took the famous Norwegian coastal cruise from Bergen to Kirkenes. It takes six days and stops at over 30 ports, ending 400 miles north of the Arctic Circle. Then we drove through the mountain and fjord country for four days. We have never seen such spectacular scenery—we ran out of superlatives!—**R.E. "Bob" McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

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For at least 12 years, our class has had an annual champagne brunch at the MIT Endicott House in early December.

This year 18 members of our class and four members from '47 and '49 attended with wives and friends. In addition to personal exchanges, there was discussion of plans for our 50th Reunion. Our class is invited to march in the procession at the MIT graduation, Friday morning, June 5, 1998. On Friday afternoon, we will plan activities for our class as the highlight of our 50th Reunion. The afternoon activities will include a reception at the President's House. Friday's activities, MIT Night at the Pops on Thursday, and Technology Day on Saturday will be the campus-based portion of our 50th Reunion. Many classmates are expected to attend this portion. Dormitory rooms will be available and blocks of rooms will be reserved at local hotels.

At prior reunions, classmates have expressed strong interest in adding to the campus-based activities by gathering at a resort hotel in the area. This tradition will be continued in 1998. No contracts have been signed, but the Samoset in Rockport, Maine, is a strong contender as one of about four resorts with the 160 rooms needed for the expected attendance. The Samoset (on Penobscot Bay) is known for gracious dining, beautiful rooms, and their 18-hole golf course. Nearby, the Farnsworth Museum houses many original Andrew Wyeth and Winslow Homer paintings, and a few miles away, the Owl's Head Transportation Museum has an extensive display.

Following the campus portion of the reunion, **Sonny Monosson** and **Graham Sterling** have outlined a visit to Bermuda via cruise ship or plane. More details will develop as the time for making reservations approaches. The April 1995 issue of the Class Notes described the cruise to Bermuda that Sonny and Graham made to obtain first-hand information. . . . **Ed Kratovil** writes to say he is looking forward to the Bermuda portion of our 50th. His wife retired recently and they plan to travel more. Cancun, Mexico, and the Holy Land are already scheduled.

John Kaymen and **Carl Boll** shared an apartment after graduation in 1948. John and his wife, Eunice, visited Carl before he died.

They swapped garden plants with Carl's wife, Shirley. John and Eunice toured China and enjoyed themselves, but it was an eye-opening experience. John fell from a tree and damaged his pelvis. Recovery is slow. They are looking forward to returning to walking, swimming, or bicycling after John's full recovery. . . .

Dave Finnegan's wife, Genie, died two years ago. On behalf of our classmates, I extend our sympathy to Dave and his family. For the last 56 years, Dave has been active with the Boy Scouts. He is still active and enjoys giving help to others. . . . **Stanley Ehrlich** is president-elect of the Acoustical Society of America. He has an acoustical consulting firm in Newport, R.I. From 1953 to 1991 he worked for Raytheon's Submarine Signal Division, and from 1948 to 1953 he was a physicist for the U.S. Navy Underwater Sound Lab in New London.

Mike Oglo is working as a patent attorney for the Dept. of the Navy at their Undersea Warfare Center in Newport, R.I. It is a fulfilling post-retirement career. Instead of the "mission impossible" middle-management type problems of the multinational telecommunications business, he is engrossed in applied statistics and the mathematics of sonar signal processing. He plans to relocate his primary home from Florida to Rhode Island very soon. . . .

Bill Hosley was a member of the delegation of the "American People's Ambassador Program" to South Africa. They visited university and government officials learning about the progress of the post-apartheid democracy. Another member of the delegation was Stan Olsen, '51.—**Marty Billett**, secretary, 16 Greenwood Ave., Barrington, RI 02806; tel: (401) 245-8963

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A call came in yesterday (Dec. 27, 1995) from the Alumni/ae office saying that someone out on the island of Oahu has found a class ring on a beach there belonging to a '49er.

Inside, there are three initials. The first is "J"; the second is either a "P" or an "F"; the third is illegible. If this is your ring, give John Blake a call at (617) 253-8260.

Back last June, **John Horton** told me he was making yogurt in Poland. I registered surprise but asked him to write me about it. The story goes that back in March 1994, he bought a former vodka distillery in Osowa Sien and is now up to 17 million liters a year at a price of about \$1.34 per liter. It is distributed from warehouses in Warsaw, Poznan, Lodz, Gdansk, and Krakow. Getting this operation up and running is a great story that boils down to a guy named Horton and a small group of devoted workers whose work ethic really makes the thing go. For example: When John was thanking a woman named Anya for getting a financial report ready and out on time, she replied: "Oh, you don't need to thank me. It's my obligation." Says John: "Could we use an attitude like that here at home?"

Len Newton is marketing industrial quality-control software worldwide. Helpfully, he adds that it will handle all quality data for the ISO 9000. . . . A clipping forwarded by Len gives brief details about the career of **Yenwith Whitney** on the occasion of his retirement January 25, 1995. Yenwith was a fighter pilot during WWII and worked as an engineer before he and his late wife, Muriel, decided to

go into missionary service with the United Presbyterian Church. They served at Cameron Christian College for eight years. Back in the states, he served for 2 1/2 years as president of Boggs Academy. In 1980, he was appointed liaison with Africa. In the Global Mission Ministry Unit, he serves as associate over Zaire and countries in Africa south of the equator. He is the father of two daughters and inherited a son when he remarried in 1979. He and his wife, Lori, live in Louisville, Ky.

Bob Gillmeister has been living in Pittsfield, Mass., for almost 35 years. He has been retired from General Electric for six years but leads a most active life balanced between four children, seven grandchildren, and civic and church affairs. On the civic front, development pressures are the big concern while, in his church, shrinking clergy ranks and other problems herald major changes. . . . **David Chipman** retired in 1986 after 30 years with the U.S. Army Materials Technology Laboratory in Watertown, Mass. He now enjoys "summer sailing, winter skiing, and in between puttering around the house."

Francis Sullivan enjoys retirement which he spreads between golf, sailing, skiing, and family. He and his wife, Gloria, travel to visit their daughters and families (seven grandchildren) in California, Texas, and England. The computer is his favorite tool, and he is starting his fourth year as treasurer of the Solomons Island (Maryland) Yacht Club. . . . **George Diligenti** has been retired since 1990 and is busy studying a fifth language—German. He has a daughter living in Rockville, Md., married to a Britisher who works for Airbus Industrie. George would still like to hear from **Spyros P. Antippas**.

Harald Bjerke is trying to start an MIT Club of Oslo, Norway and, although the idea was tried (and failed) many years ago, Harald feels "with young blood and enthusiasm now being involved, it (the idea) might take off." Note Bjerke and Diligenti were among that wonderful group of men whom I was honored to serve as we hustled dishes at Walker Memorial under the kindly eye of William Hamilton Carlisle.

Betty and Fred Reusswig are enjoying retirement which they divide between Iowa and Florida. They celebrated their 50th anniversary with their entire family last summer in "beautiful Vale, Colorado." . . . **Donn Pennell** keeps busy managing the professional building he owns in Lewistown, Mont., although, he explains, he doesn't stay in the office long enough, sometimes, to clean up the desk.

On September 24, 1995, I received a call from Arlene Wicks in which she said her husband, William, had died of cancer on June 12, 1995. I put Mrs. Wicks in touch with the Emma Rogers Society, the support group at the Institute for widows.

William Fryer Wicks (Capt. USN, retired) spent his career working at progressively higher levels in the submarine service and was president of EG&G Washington Analytical Services Center, Inc., in Rockville, Md., at the time of his death. With an SB in electrical engineering from the Institute in '49, he went on to an SB in physical sciences from Harvard and took advanced management courses from the Society for Advanced Management. One career from an extensive write-up on his career gives an indication of the nature of his work: "Director, Undersea Warfare Systems,

Naval Sea Systems Command (1975–1977). Planned, budgeted for, and executed an annual multimillion dollar program of research, development, acquisition, installation, and life-cycle logistic support of 50 different modern defense weapons systems. Supervised and directed a staff of 390 engineers, scientists, and logisticians. These systems included digital computer-controlled acoustic detectors, fire control equipment, underwater launched missiles, torpedoes, mines, acoustic communications, equipment, and a variety of special-purpose instrumentation. Directed U.S. participation in joint R&D programs with foreign countries."

My wife, Nell, and I were deeply saddened in early December 1995 by a call from **Tom Toohy** in which he said that he and his wife, Mary, had lost their daughter, Linda, to cancer. Nell and I had followed Linda's courageous battle for over a year.

I am sure I speak for the class in extending our deepest condolences to the Wicks and Toohy families.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192; tel: (617) 449-1614

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I reached a former Field Day cheerleader, **Anne Rosie Bickford** in Middletown, Conn. She claims she has never been mentioned in the Class Notes.

That oversight now ends. She has lived in Connecticut with her family since 1950, practicing her profession of architecture, and raising her family of two sons and a daughter. Anne became a registered architect in her home state, at the time one of only 12 women so honored. She retired in 1987 after working for several Connecticut firms. She notes that architecture was a good choice of field since no firm can offer much job security. The commissions come and go too frequently. Thus she could take time away while having her children and then resume her career without penalty. For many years Anne has been active in AMITA. More recently she enjoyed a tour of Japan in 1993 with her son who speaks Japanese. That added a special aspect. Anne enjoys her two grandchildren and her hobby of painting watercolors. Her paintings have won prizes and sold. My call turned out to be a "twofer" since Anne's husband of all these years is **John Bickford**. You all remember his cartoons in *VooDoo*, I am sure. John retired in 1988 from a career in R&D involving a variety of mechanical and electrical areas. One project was fuses for armaments. More recently he became an expert on bolting, which involved torque wrenches and sonar measurement of bolt tightness. John has published three books, all technical works. I think his favorite is the one on techniques for printmaking. You see, John is also a painter. His preferred medium is oils, and he has also won prizes and sold paintings. He is a contributing editor for *The Artists Magazine*. John characterizes himself as "a better artist than most engineers and a better engineer than most artists." How is that for a sound bite! My guess is that he is too modest. Since retirement John has enjoyed a trip to the Orkney Islands. Anne and John, bring some paintings to our 50th. If anyone else can claim never achieving mention here, please send me some news. A nice B&W photo would help me dress up this

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dismal column.

Leo Sartori has written *Understanding Relativity, A Simplified Approach to Einstein's Theories*. It will appear in bookstores in February. (I write this callow attempt at journalism before Christmas.) Let's all do our bit to make it reach the New York Times Best Seller List. Leo, after finishing his doctorate in physics, graced the faculties of Princeton, Rutgers, MIT, and Nebraska, where he now is chair of the physics department. While at Tech he worked with a group that formed the Union of Concerned Scientists. This led to assignments in Washington working on arms control for Carter and Bush. While there he ran into **Don Eberly**. (See my column of August/September 1995.) Leo also spent some time in Geneva on the SALT Treaty. He is married and has two daughters in graduate school. He has enjoyed trips to the Mediterranean the last few years and still plays singles tennis. . . . **Lee Richardson** writes from Moscow (Idaho, that is) that he enjoys traveling and surfing the Internet since retiring from the U. of Idaho. He sends his greetings to all Course III's. Say, Lee, what am I, chopped liver? . . . Another Course III (notice the smooth segue), **Bob Carruthers** writes from Sunapee, N.H., that in retirement he has become active in the Guild of NH Woodworkers. Last summer he visited another Course III, **Allen Swartz** in N. Falmouth, Mass. When Allen heard of all the woodworking projects he christened Bob a "woodallurgist." Bob agreed. . . . **Jim Goff** writes from Washington that he is now the editor of a Gaelic journal, *Naidheachd*, and is teaching a beginners class. . . . **Richard Schweizer** writes that he has moved from Sugar Land, Tex., to Houston. He still works with ACS Industries on new plants and plant expansions.

The October 3 issue of *USA Today* had a nice article about my best man, **Ed Perkins**. It told of the great *Consumer Reports Travel Letter* Ed founded and that he and **Eleanore Burchet** (Ed's wife) write and edit. His description of his subscribers sounds just like us. Anyone interested can call (800) 234-1970. (I am only allowed two plugs per column.) . . . In October I attended a symposium honoring one of my Course X professors, **Al Michaels**, '44. Our class was also represented by **Charlie Levy** and **George Krusen**. George told me he is back in the beekeeping business with five hives. He also is working with a group on sustainable, i.e., simple, lifestyle and trying to preserve same in Acton and George's town of Boxborough. . . . Note that I now have an e-mail address so as to make it even easier for you to send me items for this exercise in *bavardage*.—**Robert A. Snedeker**, secretary, Seven Mashie Way, North Reading, MA 01864; tel: (508) 664-1738; e-mail: <103244.1541@compuserv.com>

51 45th Reunion

Only a severe snow storm interfered with the work that your 45th Reunion Committee continues to pursue to make sure that the event will measure up to the high standards of our past gatherings. There has been an encouraging response to the "Save the Date" mailing that indicates that we should expect a large

turnout to both the events in Maine and in Cambridge. The Committee will be meeting again early in January to continue their efforts in tuning the activities for our reunion. Set your plans to attend now. This reunion will be one at which you will want to be. Co-chair **William Cavanaugh** wants to remind you that all spouses are considered honorary class members.

As such, he wants to enlist your help to encourage the spouses of our deceased classmates to consider attending. Assure them that we have a tradition of seeing that they feel comfortable and welcome as part of our class family.

My personal highlight of the year came on December 12 when my daughter, **Carole**, gave birth to my second grandchild, **Rachel Amy Gulick**. We are just thrilled to have a brilliant five-year-old grandson and beautiful granddaughter close enough to be seen at least every weekend.

On the subject of daughters, I tried to get **Fred Bumpus** to send me something on what he has been up to since his retirement. I understand that he shares time between Massachusetts and Florida. Instead, the proud father sent me a note on his daughter **Ann's** achievements. Ann, following her graduation from Union College with a double major in economics and philosophy and a brief position in New York, enrolled in a doctoral program in MIT's Department of Linguistics and Philosophy from which she received a PhD in June 1995. She is now an assistant professor in the Philosophy Department at Dartmouth College. It is rewarding to hear of our classmates' children continuing the successful accomplishments of their parents.

Reflecting a lifetime of contributions in the field of packaging, **Aaron Brody** was inducted into the Packaging Hall of Fame. He is known



Aaron Brody

for his pioneering work in frozen pre-cooked foods, aseptic packaging, microwave food heating, and controlled-atmosphere food preservation. Currently the managing director of Rubright-Brody, Inc., Aaron's career spanned positions at General Foods, Raytheon, Whirlpool, Mead Packaging, and Container Corp. of America. He has written seven books and more than 200 articles. He was the 1994-95 Professional of the Year of the Institute of Packaging Professionals and the first recipient of the Institute of Food Technologists' Industrial Scientist Award and a past recipient of their Riester-Davis Award.

The New Jersey Inventors Congress has nominated **Edwin Gabriel** as the New Jersey Inventor of the 1996 Year. He has received over 30 patents and has three U.S. patents pending on personal rescuing apparatus. His other activities include singing bass in the Baptist Church Choir and visits to patients at the Jersey Shore Medical Center. . . . Since retirement in 1992, **George R. St. Pierre** has kept busy with research projects at Ohio State University. In early 1995, he became chief scien-

tist for the Materials Laboratory at Wright-Patterson AFB. His wife is a professor of language studies at the University of Georgia. He plans to leave the Wright-Patterson position early in 1996 to move closer to Georgia.

Having gone through a period when his daughter was diagnosed with breast cancer and gratefully seeing her come through it, **Albert Cohen** has taken steps to be sure that everything possible can be done to contain this disease. He has started with the ESSCO-MGH Breast Cancer Research Fund. We applaud this action and pray that his daughter continues in her path of recovery.

A brief note from **Ted Jacobson** let us know of his retirement from the Materials Research Corp. in April 1995. . . . Following retirement as the graduate dean and professor of Chemistry from the University of California at Riverside, **Harry W. Johnson** is spending his time traveling, visiting his three children, and bird watching. His travels included Copper Canyon, Los Alamos, as well as Hong Kong. . . . From Kansas City, we heard from **Ed Martin** that he hopes to see us next spring.

Modern medicine and old fashion "TLC" from his wife, **Judith**, has gotten **Fred Radcliffe** up and going again from an illness that led to his retirement from his Radcliffe Engineering Co. He is now practicing again as a consulting civil engineer, but at a much slower and selective pace. He hopes to see us at the reunion. . . . Thoroughly enjoying retirement and time for golf, tennis, and reading, **Sam Rabinovitz** is still keeping in touch with the business world as a director of several companies, including EG&G, Inc., where he had been executive VP for the past five years.

After completing 43 years with the Merron Machine Co., **Jack Washburn** has retired, but still retains his title as chairman. He has moved to Mason's Island in Mystic, Conn., as far south as he plans to live. He continues on the board of Hartford Steam Boiler Inspection and Insurance Co.

We have received the sad news that **Fred Lehmann** passed away on November 15. I'm sure that many of you share with us the fond memories of Fred as a warm and friendly, creative, and efficient person. He became well known to our class through his many years of service as our class agent. I have a particular remembrance when he invited our entire Reunion Committee to hold a meeting at his beautiful home in Wellfleet. The house, positioned on the top of a high bluff overlooking the harbor, has a magnificent view and was clearly one of his personal treasures. He was working in New York City, but drove up to enjoy that home every weekend. You could sense his satisfaction in being able to share with us a place that brought him so much pleasure. He was well known to many others throughout the Institute through his efforts in building up the Alumni/ae Association through his position as the financial VP of the MIT Alumni/ae Association. His development talents were not confined to helping MIT. He was the director of development at Boston University for four years, the executive director of development and public affairs at the Rockefeller University, the VP for advancement at NY Medical College, and the deputy VP for development at Columbia University. He was a consultant to the National Science Foundation. His work at so many other schools never diluted his attention and feelings

towards MIT and to our class. Hugh Darden was with him towards the end and told us that Fred expressly wished that any contributions in his memory be made to the Class of 1951 Fund for Excellence in Education. We wish to express our sincerest condolences to his family. We will all miss him.

I want to call your attention to my e-mail address that has been added below. Please use it to keep in touch and to let me know of your happenings for inclusion in our Class Notes.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368; e-mail: <greenfld@tiac.net>

52

This month's news comes evenly from those who are retired and enjoying it, the semi-retired, the retired who are working full time, and those who are not retired at

all. In the first category **Jim Davidson** writes that he and Marcelle continue to enjoy golf, bridge, beach, and travel in their new home between Philadelphia and Wilmington. . . . **Bob Damon** now has 10 grandchildren, with the most recent, a beautiful girl, born last September. He and Bobbie spend Christmas on the road visiting their four children and their families. They spent several weeks in Britain last summer visiting friends and taking an Elderhostel tour. Bob says that he still does a few triathlons during the summer, comes in first in his age group in a couple, and in some is the only one in his age group. . . . **Cliff Herdman** writes of a trip from his Florida home last fall to New Jersey for his 50th high school reunion, to New York for a daughter's wedding, and to New Orleans. He notes that three of his four children are now married, and that New Orleans was a continual party where no one seems to sleep. . . . **Vincent LoCicero** is semi-retired and spends six months each year in his Wareham, Mass., home and six months in his Sarasota, Fla., home. . . . **John Fritts**, in Davie, Fla., uses his knowledge of mineralogy to advantage working as a sales associate at the Nature Company. . . . **Sanford Greenfield** has stepped down as dean in favor of teaching, and now enjoys the students and his position at NJIT's school of architecture immensely.

Manny Rotenberg has retired from University of California at San Diego, where he has been since 1961. After several years in the physics department, he served 10 years as dean of graduate studies and research. He then joined the Department of Electrical and Computer Engineering, and was department chairman for the five years prior to his retirement. He continues to teach and publish as he did before; the only difference is that his salary comes from the retirement fund. He and Paula have two sons, one at Berkeley and the other at Harvard. He says they miss seeing the old gang—**Marty Sack**, **Dave Weiss**, both **Arnie Kramers**—but he does see **Chuck Schwartz** at Berkeley from time to time. He says he is really looking forward

to our next reunion.

Charles Beckman still works as a cardiologist in San Antonio, where he is chairman of the department of medicine at the five-hospital Baptist Memorial Hospital System and a clinical professor of medicine at the University of Texas Health Science Center in San Antonio. He currently teaches advanced physical diagnosis to sophomore medical students. . . . **Alan Geisler** is a market-driven manufacturer of food products, now in Pennsylvania, where he and his son run four businesses. One manufactures pan oil (a mold release for bakers, I think), one manufactures sorbitol, a sweetener, another makes and bottles onion sauce, and the fourth distributes lecithin. He also looks forward to our reunion in Hershey. I am sorry to report, very belatedly, the death of **James Margolis** on February 28, 1984.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301; e-mail: <rflacey52@aol.com>; listserv: <mit1952@mitvma.mit.edu>

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Mort Grosser wrote to congratulate me on my appointment as class secretary, and he reports that he and his wife, the former **Janet Zachs**, have lived in the Bay Area since

1957, except for brief forays to Los Angeles and Seattle. Mort consults under the name **MG Consulting**, mostly for high-tech start-ups. He just finished a directorship with **Lazer-Tron** and recently completed two advanced strategy projects; he also serves on the scientific advisory boards of four medical-device companies and is finishing the first draft of his ninth book, a mystery set in New York in 1970. Janet is going back to school for another master's degree, this time in nonprofit administration, at the University of San Francisco. Their son **Adam** founded **Catapult Entertainment** to make the **Xband Interactive Modem**, an effort that is associated with **Blockbuster Video**, **Marvin Davis**, and **Ted Turner**.

William L.R. Rice is deep into his second career teaching high school physics in Annandale, Va., to ESL (English as a Second Lan-

ClassNotes

guage) students. He lives in Fairfax, Va. . . . **Maurice Gionfriddo** retired after 41 years with the government, 37 of which were in parachute research. To keep his hand in, he started **MPG Consultants**, a part-time consulting business, but he enjoys his semi-retirement in Westborough, Mass.

I want to hear from all of you. Please write, call, fax, or e-mail to me.—**Joseph M. Cahn**, secretary, 20 Ocean Park Blvd., #9, Santa Monica, CA 90405-3557; tel: (310) 396-6322; fax: (310) 553-0687; e-mail: <jmc20@aol.com>

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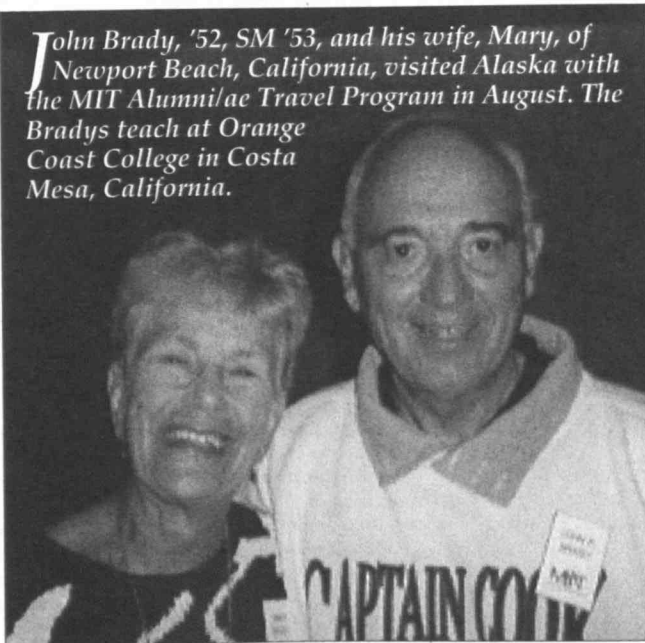
A very welcome letter from **Ray Rivero** brings us word that he is still president of his own consulting firm in Irvine, Calif., specializing in management and industrial engineering,

space planning, and manufacturing. He and his wife, **Betty**, did a lot of traveling last year, visiting Germany, France, and England in April; Hong Kong almost immediately thereafter; Canada and Alaska a bit later; and then Puerto Rico, Panama, and Acapulco. In Ray's words, 1995 was the year they stopped to smell the roses—but they clearly didn't really stop much. . . . **Dick Morley** was one of 10 members of the Society of Manufacturing Engineers to be inducted into its 1995 College of Fellows, in recognition of his "many years of outstanding contributions in manufacturing engineering, specifically the programmable logic controller." This is just the latest acknowledgment of Dick's international reputation as the "father" of the programmable logic controller. He has previously received the 1994 SME Albert M. Sargent Progress Award, the 1991 Franklin Institute's Howard N. Potts Medal, and *Inc.* magazine's 1990 Entrepreneur of the Year in New England designation. He is also a Gould Fellow of Science

and Engineering. . . . **Ernie Hinck** sends word that he has retired after 31 years with **Ingersoll-Rand Co.**, having been general manager of the worldwide Rock Drill Division the last nine of those years. Now he has gotten into traveling, visiting children and grandchildren on numerous trips from his home base in Roanoke, Vir.

Dave Wiesen reports that he is working as a consultant with the Rutgers Small Business Development Center, serving a few private clients, and otherwise keeping busy with the MIT Enterprise Forum of New York, the Educational Council, and other MIT-related activities. He has also done some traveling, to England, Ireland, and South America. He visited **Sergio Chavez** in Santiago and **Dick Degenszejn** in Rio. . . . **Marty Brilliant** is still pursuing his "retirement project," a second doctorate in economics at Rutgers. He reports that he "aced" his first exam. He also has welcomed his first grandchild, born last August. . . . **Harry Taylor** sends

John Brady, '52, SM '53, and his wife, Mary, of Newport Beach, California, visited Alaska with the MIT Alumni/ae Travel Program in August. The Bradys teach at Orange Coast College in Costa Mesa, California.



a note from Israel, writing that he retired back in October 1993. He had been hoping to teach, but a broken ankle, now held together by pins, has prevented that. So he now concentrates on his new grandson in Dallas and his "big daughter" who is a paleontologist in Kenya.

Dick Tooley has also retired—from the aerospace industry. In 1995, he and his wife sailed from Fort Lauderdale through the Panama Canal to Acapulco (they might have been followed by Ray and Betty Rivero), took an eight-week tour of the USA, and drove up the West Coast to Seattle. During their travels, they managed visits with Ray Freeman and Jim Hyde. . . . And Don McGrath is still running his winery in Saint Helena, Calif., the Villa Helena Winery. He urges everyone to stop by for a personal tour and free samples.—Edwin G. Eigel, Jr., secretary, 33 Pepperbush Ln., Fairfield, CT 06430

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Leonard Sugarman (Course IX-B) was honored in the *Panorama* newsletter of New Mexico State University as one of nine New Mexicans who received the 1995 Distinguished Public Service Award. The announcement noted that Len is "officially retired" as assistant director of the Physical Science Laboratory at NMSU, but continues to volunteer his time there. "In Las Cruces, he is known as 'Mr. Public Service' serving as public liaison between the community, the Lab, and White Sands Missile Range, helping each to better benefit from the other." The Dona Ana County Commission proclaimed the week of May 29–June 2 as Leonard R. Sugarman Week to thank him for his service to Dona Ana County and the State of New Mexico. Len, a retired Air Force colonel, joined NMSU in 1977 and retired (again!) in August 1994. He earned his master of public administration degree at NMSU in 1984 and also holds an MBA from University of Chicago. . . . Karl Reuther (Course II) writes that he and Gayle are still reminiscing about the wonderful time they had at the reunion at Prouts Neck last year—especially the wide, flat, hard beach where they enjoyed riding the lodge's coaster bikes into the ocean surf and getting sprayed with sand and salt water. Karl was able to top that, however, on his 63rd birthday when he and Gayle spent the day biking up a (low) mountain, successfully snowboarding on Mt. Hood, and then windsurfing, jibing, tacking, and waterstarting in the Columbia Gorge on Hood River in the afternoon. Quite a day! They're now thinking about climbing Mount Rainier for his 64th.

Some of you may have received a letter from George Rubissow, reminding us of another of the highlights of our 40th Reunion—the sharing of George's own excellent Rubissow-Sargent Les Trompettes wine—at our class dinner. George indicated that many people asked about where to buy his wine, so he furnished a list of retail stores in the Boston area that stock it. If anyone wants to get further information about sources in other locations, direct sales, or to arrange for a visit to his winery when in California, call him at (510) 841-9463.—Co-secretaries: Roy M. Salzman, P.O. Box 197, Rockport, ME 04856-1097; James H. Eacker, 3619 Folly Quarter Rd., Ellicott City, MD 21042

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40th Reunion

Frank Amoroso is a retired communication system engineer who is consulting with

Digital Data Modulation Studies in Santa Ana, Calif. He is a session organizer for the September 22–25 IEEE Fourth International Symposium on Spread Spectrum Techniques & Applications at the Electoral Palace, Mainz, Germany. His session is "The Role of Mitigation Bandwidth in Spread Spectrum Communications." . . . Terry Carney of Chattanooga, Tenn., enjoyed his reunion with the MIT crews that rowed at Henley in '54 and '55.

Robert (Buz) Sawyer was there along with a dozen others from the Classes of '54, '55, and '56. The reunion was during the Royal Henley Regatta in England this past July. Of the 12 oarsmen and two coxwains that competed, 10 oarsmen, the '54 coxwain, and their coach, Jack Frailey, returned to the Thames for a commemorative ceremony and row over the course. Terry is a professor of engineering in the Department of Computer Science and Electrical Engineering at the University of Tennessee. He has three daughters with Laurel, the MIT graduate, teaching bioengineering at BU.

Robert Sawyer, MD, lives in Guilford, Conn., and has an active consulting service in preventive and occupational medicine. He is also VP of ENTEK, Inc., consultants in environmental engineering. He travels widely, skis in Aspen, and has four children and two grandchildren. . . . Bill Peter has a medical software company in Minnesota. He retired early from DuPont in 1985. His software focuses on "outcome management technology" to develop improved therapy protocols for better-quality and lower-cost health care delivery. The company, Health Outcomes Management, Inc., has over 800 clients now in 40 states.

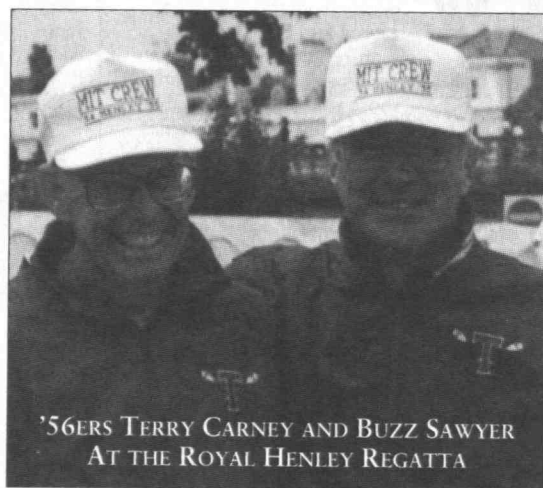
Walter F. Storer has retired and is living in Oregon in the great Northwest where he is enjoying the woods and natural beauty of the area as well as many of the cultural events. . . . Gideon Gartner will be starting the Giga Information Group, Inc., a market research firm orientated toward the needs of technology users. Giga is a combination of BIS Strategic Divisions, a \$25 million Norwell, Mass., market researcher serving vendors, and ExperNet, a Santa Clara, Calif., network of information technology experts. . . . Richard E. Quinn is director, Professional Practice in Engineering Education at New Jersey Institute of Technology (NCE). . . . David S. Shefrin has a company, Private Career School Consulting, in Phoenix, Ariz., and is involved in all aspects of career schools including curriculum evaluation, placement, marketing, advertising, and financing. He is currently working on an Arizona Israel Exchange Commission. . . . Bob Scher is president of Encoder Design Associates, a consulting company in Clifton Park, N.Y. Bob was president of the Teledyne Gurdy Co. (a division of Teledyne, Inc.) until 1992 when he left to start a consulting firm that specializes in design of optical encoders

and other measuring instruments. Bob and Audrey enjoy chamber music concerts in their leisure time.—Ralph Kohl, co-secretary, 54 Bound Brook Rd., Newton, MA 02161; e-mail: <kohl@ll.mit.edu>

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The class will be saddened to learn that the class president, Paul Nathan, died last October 15 of cancer. He was an active and enthusiastic president, whom we will all miss.

If you wish to communicate with his wife, Carolyn, drop me a line for the address. I learned about Paul's death in a letter from Bill



'56ERS TERRY CARNEY AND BUZZ SAWYER
AT THE ROYAL HENLEY REGATTA

Doughty, in which he told me that his wife, Marge, had also died of cancer in February 1995. Like most of you, I remember Marge as an outspoken, honest, and completely charming person. . . . Edward Atkinson, who had entered the ministry after graduating from MIT, died in August of an apparent heart attack. He had been the minister of First Parish Church in Cohasset. He is survived by his wife, Sally, and three daughters. Our sympathies to Carolyn, Bill, and Sally.

There are some happier notes as well. Art Bergles was selected to receive the 1995 Max Jacob Award from the American Institute of Chemical Engineers and the American Society of Mechanical Engineers in recognition of eminent achievement and distinguished service in the field of heat transfer. This is the highest national award in the field. Art is the Clark and Crossna Professor of Engineering at RPI. He has been president of ASME and dean of Engineering at RPI.

James Dow writes that he received a PhD in anthropology from Brandeis in 1973. He was elected to the presidency of the Central United States Anthropological Society in 1995. He is also editor of Volume 8 (Mesoamerica and the Caribbean) of the *Encyclopedia of World Cultures*. . . . D.A. Manthos is a member of the National Academy of Sciences Committee on Oil Pollution. . . . Lou Spradlin writes that he is taking advantage of early retirement incentives to leave GE after 34 years. He looks forward to time to spend with his wife (of 36 years), Sylvia, and two children, two grandchildren, and many unfinished projects. One of the latter is to drive an MGA roadster to the West Coast.

Paul Carr celebrated 34 years of research and development leadership at a dinner at Hanscom AFB in May 1995. His Component Technology Branch of the AF Rome Laboratory developed surface acoustic wave and monolithic microwave integrated circuit devices used in DOD radar and communications systems as well as TV and cellular phones. Among those participating in the event were Alan Budreau, Andrew Slobodnik, '65, and Allan Schell, '55.

Finally, a nice letter from Renata Cathou, who states that she retired from her consulting biz and is devoting time to the more important aspects of life. She designed and installed a Japanese garden behind her house in Lexington, Mass., and enjoys strolling through it at the dinner hour, wine glass in hand. At other times of the day, she strolls through water and weed. "With all due modesty," she writes, "it is a beautiful garden. If any of my classmates are interested in Japanese gardens, I would like to hear from them (and see them)." She still attends the Metropolitan Opera in New York, the Lyric Opera Co. in Boston, Boston Symphony, and Boston Ballet. In 1994 she went to Greece on an extended trip, and in 1995 went to the Pacific Northwest. She adds, "Last, but not least, my mother is 99 and sharp as a tack."—John Christian, secretary, 7 Union Wharf, Boston, MA 02109; tel: (617) 227-7521; fax: (617) 720-4694

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Ed Wright sends word from Titusville, Fla., that he retired from NASA after 31 years in manned spacecraft engineering, his last position that of resident office manager at

Kennedy Space Center on the shuttle orbiter project. Presently he is president of their town-house condo association in New Smyrna Beach, Fla. Ed and Winnie have three grandchildren and spend their leisure time reading, gardening, and cooking. They also "home exchange" the townhouse for travel experiences. Ed has acted as MIT Education Counselor in the Titusville high schools for the past six years. He concludes that he loves retirement. . . . Carla-Mae Richards is director of technical programs for the U.S. Fencing Association in Colorado Springs, Colo., having been its executive director for about 10 years prior to her present role. She was an EE major, transferred to Brandeis, and began her career as a programmer before establishing the first New England fencing school in 1973. . . . Ron Tweedie writes that he is still working full time as a civil engineer in planning for N.Y. State Department of Transportation. He is looking forward to retirement to pursue travel and beekeeping as a part-time activity.

Toby Carlson, his wife, and daughter visited his newly married son who is living in Paris and then took a week to bicycle from there to the south of France. Says it was great fun! . . . Twenty-seven years after starting Foamseal, Inc., in their basement, Mal Johnson and wife Florence have completely retired from the company and plan to do some traveling and visiting. He

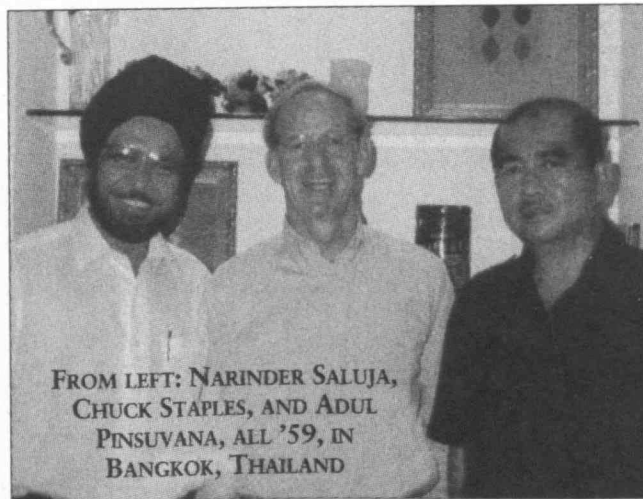
states that so far retirement is better than expected, a recurring comment from virtually all of the '58ers who have been in touch recently. Is there a message there for the rest of us? . . . Martin Victor writes that he retired from the Air Force in '93 after 30 years but is still practicing medicine as a "locums" doctor, on a regular basis in the Charleston Naval Hospital as well as several military ERs. He is living in Melbourne, Fla., and has two grandsons. His son-in-law, Dr. Michael Rabkin graduated from MIT in '76. . . . In conjunction with Technology Day, which will be on Saturday, June 8, this year, a Class of '58 social event is being planned for that evening. Watch your mail or contact me for more details.—Please send your news to Gary Fallick, secretary, 4 Diehl Rd., Lexington, MA 02173.

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Two more of our classmates are going through significant life changes. Don Spiller reports taking an early retirement from IBM in Austin and relocating to Arlington, Tex., and is back working for a small consulting firm in Dallas. . . . D. H. Avery writes from Floral City, Fla., that he will soon be retiring from Brown University, where he has been a professor for 30 years. He will continue writing from there, mainly on ancient metallurgy, along with sailing, raising Welsh Cobs, diving, and other interesting activities.

Chuck Staples maintains class ties in style. He writes: "This past fall my wife and I enjoyed a business trip through Southeast Asia, including Singapore, Malaysia, and Thailand. While in Bangkok, I had a 1959 mini-reunion with Narinder Saluja and Adul Pinsuvana. Narinder continues as managing partner for Rama Enterprise whose fine jewelry I had a chance to appreciate. I also visited Adul at the America University Alumni Language Center where he is the director, overseeing the instruction of over 5,000 students in the English language. We had a wonderful dinner at Adul's son's restaurant!" And to prove it all, see the picture! Thanks, Chuck.

Kudos to Bruce and Ann Blomstom, recently announced as new members of the Council for the Arts at MIT, a volunteer group of alumni/ae and friends established to foster the arts at MIT. Bruce continues as president and



FROM LEFT: NARINDER SALUJA, CHUCK STAPLES, AND ADUL PINSUVANA, ALL '59, IN BANGKOK, THAILAND

ClassNotes

CEO of CliniShare, Inc., a home health service in Chatsworth, Calif. Both Bruce and Ann are active with several museums, opera, and symphony groups in the Los Angeles area. They have two children. Again, congratulations (and hope this still leaves time for some tennis).

That's it for now. I continue to ask, and implore you to *actually do it*—send an update, which will be most appreciated by your classmates. Hope to hear from you soon.—Dave Packer, secretary, 31 The Great Road, Bedford, MA 01730; tel: (617) 275-4056; e-mail: <70421.1766@compuserve.com>

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I write this on Christmas Eve and the last day of Hanukkah, as Marie and I prepare to depart for Christmas in Buffalo with Marie's family. We had an early Christmas celebration with my mom, children, and grandson, and feel blessed to have had the opportunity to have four generations of Tapparos together for the festivities. I hope all of you had a happy holiday season and that 1996 is bringing everyone good health and a world more peaceful than last year's.

David Perry writes from Cornwall-on-Hudson, where he practices psychiatry. David received an MD from the University of Maryland School of Medicine in 1970, and completed his residency in psychiatry in 1974. He has practiced medicine in New York since then, both in private practice and as a staff member of universities and hospitals. . . .

Morris Salame celebrated the seventh anniversary of his consulting firm, Polysultants Co., which deals in plastic packaging of food and beverages, with clients in six countries. An update comes from Howard Hornfeld, who lives in Bogis-Bossey, Switzerland. Howie is with the United Nations Economic Commission for Europe in Geneva, where he is in charge of the Chemical Industry Section. His main mission "is to help clean up the chemical mess in Central and Eastern Europe—environmental, technical, legislative, commercial"—

and he looks to U.S. companies for help in these endeavors. Howie also remains very active in amateur theater.

From Los Altos, Calif., Chris Simonson writes that he was unable to attend our 35th Reunion because he and Jade were in Jerusalem, where Chris attended the International Symposium on Ballistics. He continues to "enjoy listening to talking books and college lectures while commuting to Lawrence Livermore National Labs." . . . Lawrence Kravitz sends word about his daughters: Clara is in her second year of graduate physical therapy, and Jennifer is a junior at Brandeis. Lawrence lives in Aberdeen, Md. and is working on the evaluation of a new assault gun for the Army. . . . Niels Ander-

sen is now an aviation consultant in Atlanta, specializing in technical planning, engineering, flight operations, and maintenance.

My AOL address brought a note from Dick McDowell urging me to "keep accessible in the electronic environment, perhaps even on the MIT Web page." I will try to get myself as wired-in as possible, but please be patient, as I'm not yet an experienced surfer.—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204; e-mail: <ftapparo@lmi.org> or <ftapparo@aol.com>

61 35th Reunion

Here are the 35th Reunion plans as of December: As always, there will be a Thursday (June

6) Tech Night at the Pops—MIT is one of the few organization that fills Symphony Hall during the Pops season. After the Pops we will get together as a class at Symphony Hall for drinks and bragging (mostly about our kids). On Saturday (June 7) we ride the D.U.C.K.s: vividly painted World War II amphibious vehicles that tour around Boston, piloted by guides with cracked senses of humor. While most of the trip is over the potholes of Boston, the tour also cruises the Charles River toward MIT, and usually then returns to Boston, drips on the pavement, and terminates at the New England Aquarium. After a class lunch at a nearby restaurant, the nautical theme continues with a talk on a wet topic (sailing, ship design or some such). Later that evening we gather for a "Sock Hop" dinner and dance—proper dress includes penny loafers for men and plaid skirts with large gold safety pins for women. Parietal hours will be observed in the usual manner.

Speaking of water, **Royce Fletcher** says that he is involved with ultralight sailboat ocean racing. When dry, he consults in telecommunications—a career he has followed since 1979. Last June he married Dr. Patricia Wilson. They live in Santa Cruz, Calif. He says, "Life is good." . . . **Al Klancnik** is another classmate with a stable career and an interest in sailing. He has been in the mattress industry for 20 years—the first 15 at Sealy, the last five with Serta, where he is VP for operations. His marriage is also stable: same woman, Pat, for 33 years. Three kids. A first grandchild is about to appear. He is a Hobie Cat 17 sailor and was sailor of the year in the fleet in Loudedale Lakes, Wisc.

Eric Essene has been professor of geology at the University of Michigan for 25 years. In that time he has trained about two dozen PhD students, most of whom have gone on to their own academic careers. He writes that he has four children: Michelle (27, a third-year medical student currently on rounds at the University of Minnesota), Karen (25, an architect and social worker now at Missoula, Mont.), Adam (8), and Zachary (5). Eric has finally given up building-climbing but still hikes into high country in the Wind River Mountains of Wyoming on research projects. Eric has occasional contact with Roger Cooke, '62, Fred Fevrier, '62, Dick Naylor, Jim Richardson, '62, and Fred Spilhaus, '62, but would like to hear from other old friends. His e-mail is <essene@umich.edu>.

Ben Turetzky writes that he has been work-

ing for the same company since the early 1960s. However his résumé is very long because, due to mergers and acquisitions, the company has changed names every couple of years: He started at Texas U.S. Chemical, which was a division of Texaco and Uniroyal. Then it became the Synpol (i.e., synthetic polymers) division of Uniroyal. Next it became the Ameripol Synpol division of Uniroyal Goodrich. By this time, Ben was VP business manager of sales and marketing and president of UGTC Textiles. Finally, Michelin bought it, and now Ben is in charge of Michelin Tire's customer service—a most difficult and challenging job. He and Reggie live at Keowee Key, a retirement community in Sales, S.C. He commutes to Greenville, S.C., where Michelin has its North American headquarters. . . . **Ed Tucker** is also in polymers. After eight years in Wilmington, Del., he has just moved to Brussels, Belgium, to run Montell's polypropylene manufacturing in Europe. Montell is a joint venture between Royal Dutch Shell and Montedison. Wife Syn Syn and daughter Arlene, a high school sophomore, have moved, too. A second daughter, Rena, is staying in the United States to finish her studies at Tufts University. . . . Another chemist, **James Mangano**, writes that he remains in Princeton, N.J., at the FMC Chemical Research Center. He's been there for 25 years. These days he works on process development for persulfate and peroxide production. He finds the local MIT club to be a continuing source of interesting events. Any classmate passing through Princeton is invited to look him up.

Terry Langendoen is on sabbatical from the University of Arizona, where he heads the linguistics department, but he hasn't gone far: he is studying the Yaqui language, which is spoken in Arizona and in Sonora, Mexico. To prepare he has been working on his Spanish so that he can live in Sonora this spring. . . . Congratulations to **Don Greenlee**, VP of Science Applications International in San Diego, who was re-elected president of the International Test and Evaluation Association. . . . **Millard Firebaugh** has finally left the Navy, and is now

director of engineering at Global Associates, Ltd., in Falls Church, Va. His daughter, Samara, is a graduate student in microelectronics. . . . Finally, a short note from **Richard Cryer**, who says he is working on a Munsell color wheel (whatever that is) that he plans to distribute to art departments in colleges, elementary schools, artists, and picture framers and anyone else who might find it useful.—**Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167; fax: (617) 734-5230; e-mail: <andrewb820@aol.com>

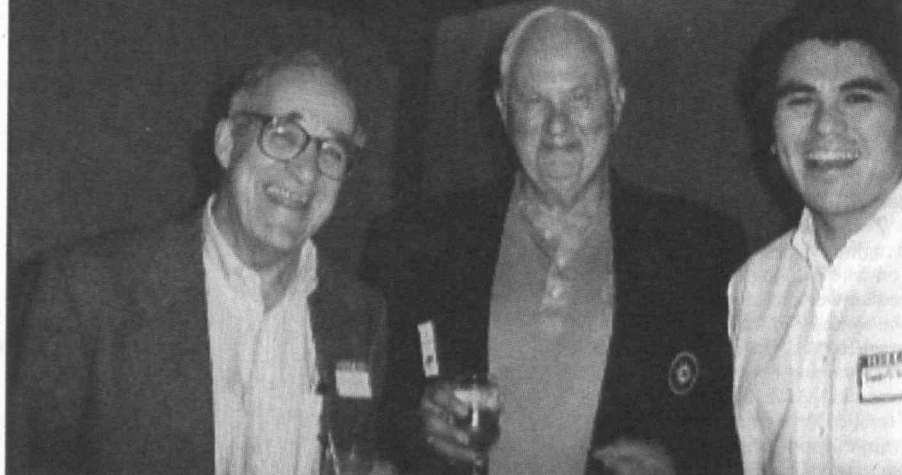
62 Frank B. Sprow became VP for environment and safety of Exxon Corp. in December. Frank previously served as VP for petroleum and synthetic fuels research at Exxon

Research and Engineering Co. in Florham Park, N.J. He joined Exxon as a senior research chemical engineer in Baytown, Tex., in 1965, after receiving an SB and SM from MIT, and a PhD from the UC/Berkeley. . . . **Modesto A. (Mitch) Maidique** has just begun his 10th year as president of Florida International University. During his tenure as president, enrollment has risen 70 percent, to over 28,000 students. FIU is now one of the 40 largest universities in the United States, and the largest in south Florida. Mitch's son graduated from Cornell last summer with a degree in architecture and now practices architecture in Miami; Mitch's daughter, a Duke graduate in mathematics, has recently been tapped to head an advertising firm called Spinoff in Coconut Grove, a suburb of Miami; and Mitch's wife enjoys her work as a school psychologist in the Dade County school system.

. . . **Peter M. Canepa** has left the world of large corporations and is now cofounder of a new company that is commercializing a 3-D display that doesn't require glasses or other headgear. Peter hopes that the 3-D technology might form the basis for the next generation of television.

After 28-plus years with IBM and a year consulting on software engineering and busi-

Anchorage-based alumni Robert Utter, '61 (left), and Robert Harris, '82 (right), welcomed Joseph Cartwright, '53 (middle), of Bellevue, Washington, to the 49th state in August. Cartwright and his wife, Marion, visited Alaska with the MIT Alumninae Travel Program this summer. A reception was held for the MIT alumninae travellers and Alaskan alumninae at the Captain Cook Hotel in Anchorage.



ness process automation, **Allan L. Scherr** has joined EMC in Hopkinton, Mass., as senior VP for software engineering. Allan says that his return to the Boston area after 30 years absence has been an unexpectedly delightful experience. . . . **John Hermanson** is beginning his sixth year as head of the physics department at Montana State University in Bozeman, Mont. . . . **Herb Selesnick** is senior partner of Sterling and Selesnick, Inc., a management consulting firm that designs and facilitates strategic planning and organizational development programs for government, nonprofit, and business organizations. He has written a number of papers on self-directed change and organizational learning, and speaks on these subjects before government, business, trade, and professional groups throughout North America.

Warren Zapol writes that his son, David, graduated from MIT in Course VII last June. Proud father Warren claims this experience as one of the most remarkable moments in his life. David is off to Stanford for a PhD in molecular biology. Warren remains in Boston as anesthesiologist-in-chief at Massachusetts General Hospital. . . . **Lynn Whelchel** practices vascular and thoracic surgery and struggles to embrace all the new electronic communications stuff. To some extent, Lynn enjoys the onslaught of managed care.

Memorial services for **Dan Thornhill** were held at Ginter Park Baptist Church in Richmond, Va., on December 3, 1995, and at Park Street Church in Boston on December 10, 1995. Invitations to these memorial services were sent out via the mit1962 e-mail network in November. Memorial donations may be made to the scholar loan fund in Dan's name, administered by Ginter Park Baptist Church, 1200 Wilmington Ave., Richmond, VA 23227, or to Chilton House (hospice), 65 Chilton St., Cambridge, MA 02138. Thanks are extended from Dan's parents, Bob and Beulah Thornhill, and from his family and friends. Many thanks to **Ed Feustel** for keeping us posted on Dan's passing. . . . **Jeremy Goldberg** sent an e-mail message expressing his sense of personal loss at the passing of classmate Dan Thornhill. Jeremy has completed 35 years of federal service, primarily as a civilian employee of the Navy Department. He and his family visited Boston during the Thanksgiving holiday and paid his respects to the Great Dome. He notes the many new buildings since our days at MIT and especially the MIT Museum, with its extensive collection of MIT memorabilia.

A note from **Richard Reitman** expresses his thanks for the news on his many classmates' lives via mit1962 e-mail, and for the friendships and associations from his MIT days that have played a major role in making his life so full. "After all these years, my friends from school continue to make a difference in the world in so many ways and still maintain contact with each other, often in a lighthearted and playful way. Really warms my heart." He and his wife, Diane, continue their many endeavors in the San Francisco Bay area. They visited with **Roy Finkelstein**, other classmates, and fellow TEP fraternity brothers in Los Altos at Thanksgiving. Richard reminds us that fellow MIT alumnus **David Espar** produced a PBS special on rock and roll. He recommends catching it on the reruns if you missed the original broadcast.

If you have access to the Internet, please put a message through to <mit1962@mitvma.mit.edu> or you can send a message directly to me at <busf038@uabdp.dpo.uab.edu>—and you too will get the unedited and unexpurgated class news while it is still fresh, hot off the Internet. You can fax your news to (205) 934-1318. But even if you still communicate by traditional methods, please send your news and personal notes to **Hank McCarl**, secretary, P.O. Box 352, Birmingham, AL 35201-0352.

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e-mail: <71271.2627@compuserve.com>

Please send news for this column to: **Shoel M. Cohen**, secretary, Dept. of Psychology, Nassau Community College, Garden City, NY 11530; tel: (516) 489-6465 (h);

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I regret to announce the death of **Aditya Birla**, a Course X graduate. At his death he was chairman of a number of major Indian companies including the Hindalco

Group, Grasim Co., India Rayan, Indo-Gulf Fertilizers, and a host of other smaller companies. He also headed 15 Indian overseas joint ventures and was listed in the *Fortune 500*. He is survived by his wife.

Two classmates who are working for AT&T corresponded this month. **Tom Arnold** (Course VI) is heading a strategic planning organization for one of the equipment business units. His older son, Bill, graduated from MIT in 1994, spent a year at Yale, and is now in an environmental engineering PhD program at Johns Hopkins. Younger son Eric is a junior at Boston University majoring in English, so Tom and wife Carol still get to spend a lot of time visiting the Boston area. . . . **Larry Rabiner** (Course VIA) has worked at AT&T Bell Laboratories Research since 1962. He was recently named VP of the User Experience Research Division, leading activities in speech processing, image processing, user interfaces, personalized agents, and human-centered engineering. His oldest daughter, Sheri, is finishing her third year of law school at NYU. Middle daughter, Wendi, began graduate work towards a PhD in electrical engineering at MIT, while his youngest daughter, Toni, is a sophomore in high school. . . . **Thomas Thornbury's** company, Softub, Inc., was recently named to the *Inc 500* list of fast growing companies for the third consecutive year.

Finally, in recognition of his unique talents, our classmate Professor **Charles Counselman** was recently selected to teach part of MIT's charm school course. This is an independent study activity during IAP that MIT has instituted to smooth a few of the rough edges some MIT students (graduates?) have. Subjects include personal hygiene, how to dress, and a full range of social skills. Chuck was unsure which of his talents led to this honor, but perhaps since he is a professor of earth and planetary science the MIT Administration felt that he might have some experience in strange life forms.—**Bill Ribich**, secretary, 18 Revere St., Lexington, MA 02173; tel: (617) 862-3617; fax: (617) 890-4084; e-mail: <mit64@mitvma.mit.edu>

WOLF, GREENFIELD & SACKS, P.C.

SPECIALISTS IN INTELLECTUAL PROPERTY LAW

David M. Driscoll
Mark A. Fischer
James J. Foster, '67
Edward R. Gates
Lawrence M. Green
George L. Greenfield
Therese A. Hendricks
Steven J. Henry, '72
Jason M. Honeyman
Philip G. Koenig
Ronald J. Kransdorf
William R. McClellan
A. Jason Mirabito
M. Lawrence Oliverio
Edward F. Perlman
Stanley Sacks
David Wolf

OF COUNSEL
Anthony J. Janiuk
Charles E. Pfund

PATENT AGENTS*
David E. Huang
Helen C. Kindregan
John Van Amsterdam,
PhD '93

TECHNOLOGY SPECIALISTS*
Sean P. Daley, PhD '94

*NOT ADMITTED TO ANY BAR

John N. Anastasi
David L. Cavanaugh
Brett N. Dorny
Douglas C. Doskocil
Kristofer E. Elbing
Gary S. Engelson, '80
Richard F. Giunta
Peter J. Gordon, '90
Helen Greer, PhD, '74
James M. Hanifin, Jr.
Peter C. Lando
William A. Loginov
James H. Morris
Timothy J. Oyer, PhD '91
Jennifer Paine
E. Robin Plumer
Randy J. Pritzker
Christopher S. Schultz
Thomas M. Sullivan
Douglas R. Wolf

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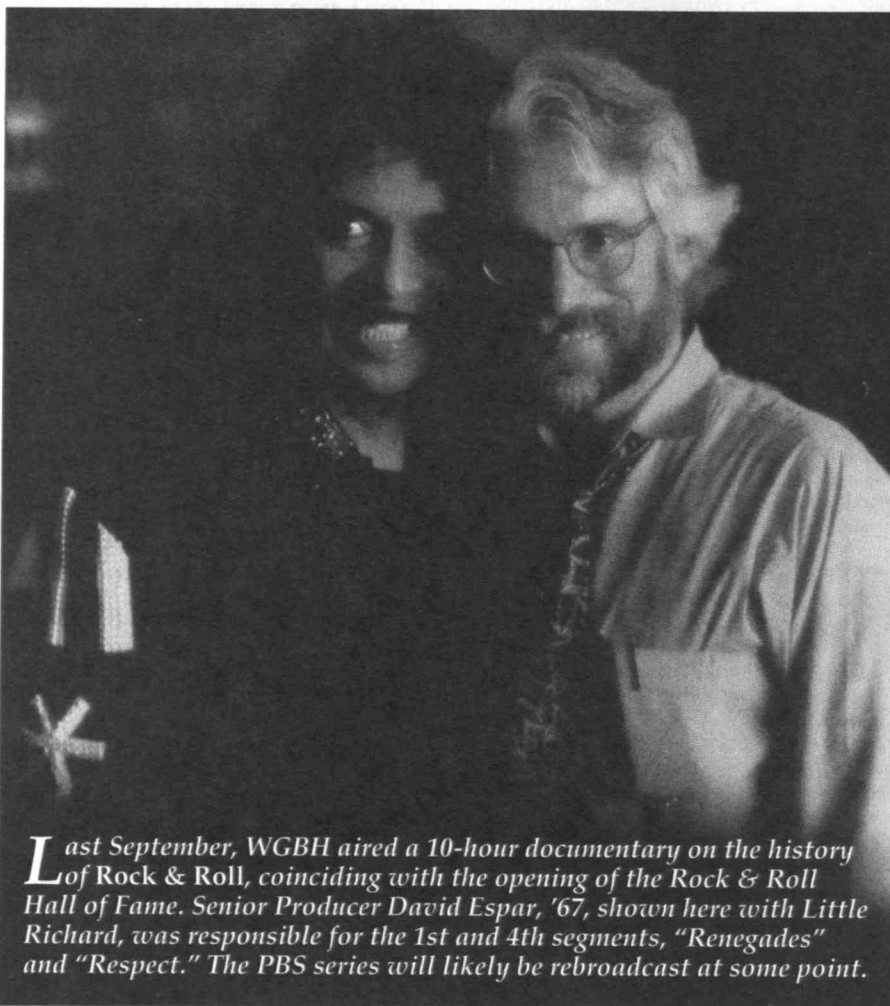
Charlie Frasier chairs the board meeting at La Jolla Presbyterian Church (I'm not sure whether he's pulling my leg when he says it's the church's surf group). He has

also been elected an elder. Son Geoff will get a BA in philosophy from Reed in May. . . .

Yazan Sharif has left Indresco to join BusinessWorks, Inc., as chair. BusinessWorks produces interactive multimedia information and training systems for Fortune 500 companies. . . .

Neil Lupton saw **Steve Gray** at a Boy Scout meeting recently in Syracuse. Both are active in the scouts. Steve is on the faculty at Cornell and lives in Ithaca.

At Siemens Research in Princeton, N.J., **Tom Ostrand** works on techniques for assuring software safety in medical devices. Daughter Rachel is 8 and, like most of our kids, running circles around him on the PC. . . . **Jim Stuhmiller** remains at Jaycor in San Diego after 20 years, where he is a senior VP. Older daughter, Jackie, just graduated from Berkeley and is headed to graduate school at Cornell. Younger daughter, Rigel, is a freshman at MIT.



Last September, WGBH aired a 10-hour documentary on the history of Rock & Roll, coinciding with the opening of the Rock & Roll Hall of Fame. Senior Producer David Espar, '67, shown here with Little Richard, was responsible for the 1st and 4th segments, "Renegades" and "Respect." The PBS series will likely be rebroadcast at some point.

Alan Mitchell is heavily involved in transforming the Space Needle in Seattle into a new virtual reality-based entertainment destination. . . . Billy Roeseler asks that you read the cover story in *American Kite* (Fall 1995) to find out what he's up to. There had been some information about him on the ESPN *Sportzone* Web site <web1.starwave.com>, but it appears to have been superseded by newer news. . . . Art Bushkin is actively seeking investments/acquisitions in the software and information service areas (6030 Oakdale Rd., McLean, VA 22101).—George McKinney, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167; tel: (617) 232-4710; e-mail: <georgemck@aol.com>

66 30th Reunion

Please send news for this column to: Eleanore Klepser, secretary, 84 Northledge Dr., Snyder, NY 14226-4056; e-mail: <vismit66@ubvms.cc.buffalo.edu>

67 Please send news for this column to: Charlotte and Jim Swanson, co-secretaries, 878 Hoffman Terr., Los Altos, CA 94024; e-mail: <jswanson@lat.com>

68 The class heroes of the month are Leah and Neil Cohen <ncohen@eden.com> who heeded our advice and e-mailed us directly. So we are granting them instant gratification, well as much as is possible with *TR*'s lead times, and printing their message in toto: "Reading the notes about classmates with children in college made me want to send a note. Our younger daughter, Debbie, started kindergarten in the fall and is absolutely thrilled about just losing her first tooth. Our older daughter, Charna, completes middle school this year and is already taller than her Mom, although Leah won't admit it yet." . . . From Santa Claus territory in Sofiemyr, Norway, Jack Zeigler writes that his children are now 10, 12, and 14. Jack is still flying radio-controlled airplanes with his boys. He also runs (5-10 km) and does karate (green belt) to keep in shape. . . . Closer to home in Simsbury, Conn., Henry Dixon and his wife, Peg, have one daughter at home, K.C., who is a senior in high school. Their older daughter, Elizabeth, is in her second year at UVA in architecture. Henry is president of Conair Martin, a division of Conair Group, manufacturers of robots for plastic injection molding and granulators for plastics recycling. . . . George Phillies <phillies@wpi.edu> writes, by snail mail, that he is "alive, well, revolutionizing—well, improving—scientific understanding of polymer solution dynamics, complex fluids,

wavelets, and statistical mechanics. Occasionally look to get married—no success there. Wrote SF novel, now trying to sell same." . . . That's all we have for now. Keep those cards and letters and e-mail coming.—Gail and Mike Marcus, class secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818; e-mail: <mmarcus@fcc.gov> or <ghm@nrc.gov>

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Please send news for this column to: Eugene F. Mallove, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304; e-mail: <76570.2270@compuserve.com>

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This month we actually received some mail to go with our reserve of e-mail from last month. First we will dip into our reserve.

Bryan Lewis responded to our October plea: "Sure, I've got some news. First time anyone ever asked me by e-mail. The 25th Reunion sparked a bit of socializing among some old Sig Ep friends living in the Boston area. In the last few months, I've had get-together dinners with people I hadn't seen in years, including Mike Dickens, Frank Manning, George Katsiaficas, Ron Kole, Dale Nelson, and Mike Titelbaum. Most of them aren't e-mail junkies like me (i.e., they're too busy to send their news), so I'll take the liberty of offering a synopsis of what I heard from each of them. I apologize to them for errors.

"Mike Dickens has changed companies several times over the years, mostly as head of marketing for small private companies selling CASE and embedded-system software tools. None of the previous companies hit the home run he was looking for. (You can find most of this in his contribution to the reunion bio book.) But he recently became VP for marketing for iLogix back here in Massachusetts and seems pretty happy over how it's going. He still has his wrestler's build, is a true family man, and has two (or was it three?) great-looking kids.

"Frank Manning is still working very hard as CEO of Zoom Telephonics, which won't surprise anyone who knows him. Zoom is doing great in the current computer-communication boom; their stock price doubled during the summer of 1995. What will surprise Frank's old friends is that he's starting to take time to enjoy life. He's remarried, has a new daughter, and acts like he's just discovered kids. (I mean that in a good way.) After working without a day off for 15 years, he took his first vacation this summer.

"George Katsiaficas is a tenured professor at Wentworth Institute of Technology. George seems more laid-back than my last memories of him. Great beach haircut and shirt! He's dedicated to his two kids. He's also very modest. It wasn't until I bought his book about 1968 and read his bio that I learned he'd gotten his doctorate and was a Fulbright Scholar. George is the only one of us get-togetherees who can carry on a nontechnical conversation with a total stranger. I saw him do it in an Irish pub in Cambridge after one of the dinners. We were sitting next to a woman from Brazil—so of course my conversational cup-

board was bare—but George knew all about Brazilian political movements and talked to her for half an hour. Amazing.

“Ron Kole is president of Intermetrics Micro Systems, Inc., which sells embedded-system software tools. He’s traveling a lot, frequently to Japan, but he likes running his own company and product line, finally. (He seems to be extremely good at it.) He’s remarried, has two adorable little girls, and is living a picture-perfect suburban life in Lexington, Mass.

“Maybe I’m so impressed by all these old friends with their young families because I did it in the opposite order. I had my family young, while still at MIT. My kids are now grown and gone (I have three grandchildren!), and I’m working weird hours in a software start-up in Cambridge. My company, CyberGear, develops virtual-reality-enhanced fitness equipment and games. My home and extended family is in Portland, Maine, so I’m just a working machine during the week in Cambridge. Which is why I started organizing these get-togethers. At our last dinner we were asking what happened to Frank Pompei, Peter Vernam, Lee Shaeffer, Dan Tyler, Dick Hood, and A.J. O’Donnell.

“Dale Nelson is a software developer (another weird-hours e-mail kind of person) for a company that develops completely automated warehouses, up in Rochester, N.Y. . . . Mike Titelbaum is still at DEC. He’s happy to be back on the chips side of the business: business operations manager of Digital Semiconductor Marketing. He claims he’s the only chips person at Digital not working on the Alpha. He, like Ron Kole, has two children and a lovely big house in the burbs (Framingham, Mass.), but Mike’s children are a little older. The elder (son) is a sophomore at Carnegie Mellon.”

John Carroll reports, “I teach at the Sloan School and study organizational decision-making around safety management, particularly in nuclear power plants. My wife, Helaine Carroll (Simmons, ’70), is an accountant with Cambridge Heart, Inc., whose CEO is Jeff Arnold, ’72. Helaine and I celebrated our 25th anniversary last summer with a cruise of the Greek islands and Turkish coast, joined by Alain Hanover and Carol Hanover (Simmons, ’70; also celebrating their 25th), and wound up in Beijing where I taught for three weeks at Tsinghua University. Our son, Mike, recently graduated Washington University in St. Louis and is working in Richmond for Signet Bank; our daughter, Deb, is a sophomore at University of Pennsylvania.”

Hugh Masterman writes, “I have recently completed a doctorate in computer science at UMass and am working at the MITRE Corp. as associate dept. head of the Applied Technology Department. At MITRE we are exploring applications of virtual environments to command and control. My wife, Jeanne, and I are enjoying an empty nest, as my daughter, Lisa, is pursuing a doctorate in Natural Language Processing at the University of Delaware and son Tom is a sophomore at Boston College.”

Tyler B. Thompson tells us: “After graduating from MIT in 1971 (I stayed another year to complete a second SB in Course XXIB, Humanities and Science, partly because I enjoyed it and partly to make a statement on my résumé that I’m not just a narrow ‘Tech Tool’), I earned a PhD in physical organic chemistry, Uillinois/Urbana-Champaign, and

went to work for The Dow Chemical Co. in 1976. I’ve been in R&D the whole time, living in the wonderful community of Midland, Mich. (really, a very nice family town, like an affluent suburb without the decaying urb!). My present job in the Cooperative Research office of External R&D, arranging sponsored research projects and collaborations with universities and federal laboratories, is great. I love doing my part to combat the NIH Syndrome (“Not Invented Here”). This fall we sent our firstborn daughter, Joy, off to the University of Virginia to study architecture. We have two boys still at home, in the eighth and tenth grades.”

James Korff e-mailed: “After a 15-year stint as project engineer and project manager at Helios Industries/Birdair, Inc., in charge of design and installation of tensioned fabric membrane structures, I am now seeking a new endeavor, preferably with a “learning organization” in the S.F. Bay Area. I and the rest of the gang—Suzana, Fred (10), Arthur (8), and Rebecca (3)—have shifted our paradigms and would love to hear from friends and networking associates, wherever in cyberspace they are.”

Steve Cushing explains the “interesting” activities in which he is engaged. “I wrote the feature articles, both on fatal aircraft miscommunications, in the Fall 1994 issue of *Verbatim: The Language Quarterly* and in the July 1995 issue of *Flight Safety Digest*, published by the Flight Safety Foundation. I’m scheduled to present a paper at the first-ever conference on political linguistics in December 1995, sponsored by the Belgian Linguistic Association. I have my own contra dance band, Plane Without Wings, which was scheduled to perform at the Boston International Festival at the end of October 1995, and I also lead an open band, Spontaneous Combustion, that plays for beginning dancers on first Saturdays at the Cambridge YWCA.”

In our “snail mail,” we received a note from Stephen Cooper of Sherman Oaks, Calif., stating that he was just starting earthquake repairs, a task that “was truly no fun.” He also claims that medicine is a “dying” profession, so that he is contemplating a career change. . . . Stephen Cohen wonders whether he is part of a family with a record number of generations who attended the Institute: his grandfather Morris Omanskyk, ’11; his mother Frieda Omansky, ’45; and his daughter Dena Cohen, ’99. Stephen comments that “half the generations are female, pretty much a reflection of the 1990s, but highly unusual in the 1940s!”

This is probably all the *Review* staff will allow us to print this month. There is still some e-mail left, and we hope you keep sending us more communications.—Greg and Karen Arenson, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023; e-mail: <dhhm13d@prodigy.com>

71 25th Reunion

Gim P. Hom remembers that his class of Stuyvesant High School in New York City had the largest number of freshmen enrolled in one class at MIT—13. They included Saul Cohen, Robert Gallant, Rich Goldberg, Mark Franston, Ken Houser, Gim Hom, Mark

ClassNotes

Pasternak, Calvin Powell, David Salstein, Richard Schwartz, Howard J. Seigel, Al Solish, and Jed Stein. All but two graduated in 1971. Saul Cohen dropped out and Jed Stein died before graduating. Five now reside in the greater Boston area: Ken, Mark, David, Richard, and Gim. Gim would like to get together in the spring or at the reunion. He is still married to Mildred, and his two daughters are a high school senior and an eighth grader. His oldest hopes to attend Brown, Princeton, or Stanford, but not MIT because it’s too close. He’s been at Digital Equipment for the last 17 years and is responsible for product marketing for the Storage OEM group.

John D. Graham is the coauthor of a book published by the Harvard University Press entitled *Risk vs. Risk: Tradeoffs in Protecting Health and the Environment*. John is professor of policy and decision sciences and director of the Center for Risk Analysis at the Harvard School of Public Health. . . . Jerry Bushnell has a thriving medical practice in Issaquah, a suburb of Seattle. His three children are 6, 10, and 13. His wife, Karen, has returned to school part-time. . . . David J. Leechey is associate professor of medicine at Loyola University, Chicago School of Medicine, and section chief, Renal and Hypertension, of Hines VA. He has a private practice at MacNeal Hospital in Berwyn, Ill. . . . Jerry Croan is president of Caliber Associates, which has grown to over 80 employees and specializes in management consulting and social science research in such areas as child and spouse abuse, juvenile justice, drug treatment, and military family policy. His fellow AEP Alan Marshish visited with Jerry and his wife, Sandi, this summer. Alan is living in Geneva and is working on “international standards.”

The 25th Reunion is this June. Please join us for a great time.—R. Hal Moorman, secretary, P.O. Box 1808, Brenham, TX 77834-1808

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Adnan Akant is still a managing director and partner at Fischer Francis Trees and Watts where he has been since 1984. His firm is a fixed-income manager with over

\$20 billion in assets. His responsibilities are global bonds and currencies. Alison Heiserman (Wellesley ’77) and Adnan have been married since 1981. They now have 3 children, Sara (8), Adam (6), and Elizabeth (1), who keep them busy and young, and bring great joy to their lives. . . . Steve Taran and Ellen Laderman (Harvey Mudd ’86) were expecting a baby in February. . . . William A. Gahl saw former MIT wrestling coach Wil Chassey last year. He looked great. Write William at 5122 White Flint Dr., Kensington, MD 20895 for Wil’s address. William “remains in the intramural program of the NIH performing biochemical and molecular research into pediatric genetic diseases.” He sends his best to all the Bexley buddies. Speaking of which, I was in Cambridge in October and saw a number of classmates, including

Bexleyite **Richard Weissberg**. Richard has left Lotus and has his own small company, which does groupware consulting, The Jacobsen Group: . . . I also saw **Kathy Kram**. She continues to enjoy her family and teaching at BU.

Our class president, **Bonnie Kellermann**, is already starting to think about our 25th Reunion (which by the time you read this will be barely a year away, early June 1997!), when she is not busy being the recording secretary for MIT, or skating with her championship precision skating team. . . . **Carliss Baldwin** was busy teaching a new course (for her) at the Harvard Business School, but looking forward to the spring semester when she can finish writing her current book. Her husband, **Randy Hawthorne**, '71, continues to do real estate deals with the Boston Financial Technical Group.

Leslie Klein was inducted into the College of Fellows of the Royal Architectural Institute of Canada at the RAIC Conference in October 1995 in Calgary, Alberta. His 25-person firm in Toronto, Quadrangle Architects Limited, continues to flourish despite hard economic times. Leslie also founded Quadrangle Architects Pacific in Vancouver, British Columbia, in August 1994. One of his residential projects, the 248-unit Tatty and Pathways non-profit homes, in suburban Toronto was awarded by the Boston Society of Architects in June 1995. . . .

Pat DeArme (Pat Hecht) and her husband, **Barry Lutz**, are still living happily in Denver. Pat, now a CPA, is busy running her consulting firm which specializes in healthcare management and systems. . . . **Albert Yee** had his yearly backpacking/hiking trip last October with **Jerry Shadix**, **Gordon Sheckect**, and **Mark Goodrich**, '73. They were in the Grand Canyon and the Havasupai Reservation.

Charles Oransky is practicing law in Newark, N.J., at the firm of Helling, Linderman, Goldstein & Siegal. His wife, **Dee Helling**, is also a partner in the firm. They have four children who keep them very busy when they are not practicing law. . . . **Lawrence E. Klein** is currently the president of the District of Columbia Society of Internal Medicine, which works to help doctors maintain and develop as effective and satisfying career in medicine as possible. He was also a delegate to a recent D.C. Medical Society House of Delegates to the American Society of Internal Medicine Annual Meeting, which was held in D.C. He got to welcome the entire House of

Delegates when the session opened. Last spring he got back to Boston to attend the 25th Anniversary of PIKA of which he was one of the founding members. It was "nice to see it still in operation."

Arthur Sze was one of 10 recipients of the 1995 Lannan Literary Awards. Arthur has published five collections of



Arthur Sze

poetry, and currently lives with his family in Santa Fe, where he directs the creative writing program at the Institute of American Indian Arts. . . . That's all the news for this month. It is just before Christmas as I write this, and you will get this news at Easter. I have spent

the winter in Vail, but I am returning to Florida at the start of May, so send your news to me there, and I look forward to you sending in your news to share.—**Wendy Elaine Erb**, co-secretary, 6001 Pelican Bay Blvd. #1001, Naples, FL 33963; **Dick Fletcher**, co-secretary, 135 West St., Braintree, MA 02184; tel: (617) 843-5864

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Margaret (Teager) Tharp writes she is married to **Steve Tharp**, '71, and had spent nine years with Lockheed as a software developer. Currently, she is a senior software engi-

neer and software QA manager for Mellcor Instruments, a medical instrumentation manufacturer. She lives in Bridgewater, N.J., with daughter **Kathie** and son **Ronnie**. . . . **John Miller** relocated from New Zealand to California in 1989, and has since been promoted to EVP and general manager of Carter Hold Harvey Roofing, a manufacturer of stone-coated steel roofing panels.

Mike Perlmutter, along with **Joe Bregman**, '66, started Fibersense Technology two years ago. The Norwood company, with a dozen employees, makes fiber-optic gyroscopes and other fiber-optic-based sensors. . . . **Steve Waller** is back in San Antonio as chairman of the ophthalmology department at Wilford Hall, USAF Medical Center. Wife **Jane Ward** (Wellesley, '72) shares his specialty, and their hobby—Third World eye surgery, done on five continents in the past two years. Daughters **Katie**, **Jeanie**, and **Chelsea** are thriving in south Texas.

A few shorts from various folks named **James**. **James Snell** received the SUNY Chancellor's Award for teaching excellence. . . . **James Weihe** is a now-retired psychiatrist and lives in Kailua, Hawaii. . . . **James Reuss** is in Waukesha, Wis., as a manager of advanced development at Criticare Systems, making critical-care medical monitors.

Russell Dominique, who swears he could "write a book on how not to run a company," is in temporary unemployment for the first time, and (but?) invites communications from MacGregor "A-entry" and Burton "Wazoo" alums when in the D.C. area (he's in Silver Spring, Md.). E-mail is OK too, at <rdominique@aol.com>. . . . **David Mark** recently finished his sixth year in the R&D group with Clintec Technologies, the clinical nutrition component of Baxter Healthcare. His group brought no fewer than 21 new products to market last year. His and **Jean's** kids have hit the teen years, the knees and ankles hurt too much to jog anymore, but he's bicycling over 2,500 miles a year.

Robert Millard, a managing director at Lehman Brothers in New York, was named to the Council for the Arts at MIT. . . . **John Lane** was appointed president of Aerospace Metals, replacing the retiring president, after six years with the company. . . . And yours truly has been pumping furious iron at the Reston Health Club, in a futile effort to be taller by the year 2000. It is about as enjoyable a pastime as one can imagine—little successes every day.

Write or e-mail!—**Robert M.O. Sutton**, Sr., secretary, "Chapel Hill", 7721 Churchill Ct., Marshall, VA 22115; e-mail: <sutton@smp.pcmail.prc.com>

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We start out with a most posterous claim: **Lawrence Russell** claims his new and first daughter, **Katherine Athena**, is the cutest baby in the universe. Where have we

heard that before?! He is group manager of business development at Sun Microsystems and enjoying the good life. . . . **Mark Davison** is with the same little software company, Visio Corp., which is on its third name in its short four-year life. It has 150 employees in offices around the globe. Spent 15 months living in Dublin with his family setting up office there. His children: a daughter in kindergarten and a son in the terrible 2s (a period we just gratefully finished with our daughter Anna!). Son is either a reconstructionist or an engineer in training (interpretation: he love to disassemble everything!). . . . **Richard Hartman** recently had knee surgery. His oldest son is a junior and considering MIT (we'd all be disappointed if he didn't, Richard). **Patrick** just started high school. **Leslie** and **Bridget** are in fourth and second grade, respectively. Went to the Rockies for three weeks of outdoor living and adventure. He was recently promoted to associate professor clinical of OB/GYN at Washington University in St. Louis.

Al Lakin was "downsized" by British Petroleum a year ago and is sorry he missed our 20th Reunion, especially their good friend **Bev (Lewis) Wilson**. Al is now the business manager and legal counsel for DEMI, a small R&D firm in Santa Barbara. They're developing low-cost, low-mass batteries for electric cars. With supply and demand in mind, they are working to supply the batteries for the Zero Emissions Vehicle requirements in California and the Northeast. Although he runs the business side of the operation, the chemistry manager occasionally shares his chemistry playpen with this former chemist. (You can take them out of the lab, but you can't. . . .) Married 21 years now to **Sandra Fisher**, '75. She's moved from Symantec to a small Macintosh software house in Thousand Oaks. Sons **Paul**, 14, and **Andrew**, 9, have taken the Internet connection hostage from dad and mom. Both boys play soccer, and Al gets to relive IM days as a referee. He is active as local squadron commander in the U.S. Power Squadrons, with a low draft lottery number (353). Their small sailboat doesn't get enough use. Finally, Al says standing naked in front of the shower is not the place to be, as he was for the Northridge earthquake in 1994. Says bouncing in bare skin against a shower door with the lights out and everything in the bathroom falling on the floor around you not only makes you feel vulnerable, it's also very persuasive re: postponing the shower! Thanks for the newsy letter, Al!

Jeffrey Mayne and his wife, **Katherine**, are in their third year of sharing a tenure-track position in the Biology Department at Birmingham Southern College. They get in what research they can between teaching responsibilities and raising sons **Sam**, 2, and **Ben**, 5. . . . **Harvey Michaels** has been president of Xenergy, Inc., in Burlington, Mass., since November. It's an energy services company with about 250 employees. He succeeded another MIT grad, **Stan Kolodkin**, '54, president since the company's founding in 1975 and now blissfully retired. All's well both at the company and more importantly at home in Wayland

with lovely wife, Amy, and children Laura, 15, and Andrew, 12.

Elizabeth (Bagnall) Scarito has finished a Maryland residency in internal medicine and has been on sabbatical thinking about plans for future practice and giving husband Phil tag-team relief from Super Dad role. Only son Michael (and what are the names of other sons? Just kidding!), keeps them busy with science experiments, tropical fish, piano, scouting, sports—all the stuff that makes it difficult to fit in time for work! . . . **Ronnie Selbst** has been trading options on the American Stock Exchange for the last 10 years. Heavily involved (does that go without saying for MIT grads?) in reconstructive Judaism, which encourages Jews to participate in both the American and Jewish civilizations and to apply moral and ethical values of religion to daily lives. Ronnie would welcome dialogue with any readers.—Co-secretaries: **David Withee**, 3702 Adams St., Two Rivers, WI 54241-1404; tel: (414) 794-1331; **Barry Nelson**, 65 Hillside Ave., West Newton, MA 02165-2543; e-mail: <bnelson@cspi.com>

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Please send news for this column to:
Jennifer Gordon, secretary
18 Montgomery Pl.
Brooklyn, NY 11215

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20th Reunion

As your secretary prepares these Notes, it is New Year's Day, 1996. A major advantage of becoming a member of our Class of 1976 e-mail list is being able to receive a copy of the column as e-mail within minutes of its submission to *Technology Review* for typesetting, rather than waiting for the particular issue—April, in this case—to arrive in your mailbox. Given this advantage, please send us your e-mail addresses!

From the regular mails, **David August** writes: "My wife, Barbara, and I are settled and happy to be back on the East Coast. My job as a surgical oncologist at the Cancer Institute of New Jersey/Robert Wood Johnson Medical School is a handful, but it's exciting to help build what should be the next NCI designated comprehensive cancer center. Number one son, Sandy, is now 2½, and his new brother, Harry, 11 months, is about ready to walk. I missed getting back to Burton House for DTYD XV, but hope to visit some time this year!" . . . **David Leighton**: "After 14½ years at GenCorp Aerojet in Azusa, Calif., I have taken a position at Lockheed Martin Missiles & Space in Sunnyvale, Calif. Before leaving, I won an R.B. Young award for technical innovation at Aerojet in the science and technology category. I was also nominated for a GenCorp technical innovation award; the decision is pending." . . . **James Wajda** finished a master's in computer science at RPI in 1995. He is starting a new job, still at IBM, but will be working on TCP/IP for the Mainframe Operating Systems (specifically for MVS). He plans to move to North Carolina once he's finished at RPI.

Courtney McCracken says, "After 16 years in the Navy Civil Engineer Corps (and an ear-

ly 'retirement'), Lynn and I landed just outside Ann Arbor, Mich., where I work for a construction management consulting firm. We have two boys in high school and a daughter in middle school. I'd like to know if there are any of my MIT friends living nearby." . . . And from **Richard Jamison**: "My wife, Beverly Ross Jamison, '75, and I have settled into our new house in Burke, Va. We were proud when our daughter, Ruth, was offered admission to MIT, but she chose to go her own way. She started attending Carnegie Mellon University last September." . . . Also from the military, your secretary has a long curriculum vitae from Commander **Robert Struth**. Some highlights: Bob graduated from the Navy's Top Gun school with distinction, has piloted F-14s (these jets are the ones that land on aircraft carriers) among other aircraft, and is the only, and likely last person, to land a fixed-wing aircraft, his personal ultralight, at Camp David at the heliport. It was with the permission of the appropriate authorities. Assuming he makes it to the reunion, your secretary can assure you that he has a lot of storytelling to do, all highly interesting.

Acton Medical Associates, PC (Acton, Mass.) has announced that **Ingrid Gorman**, MD, is now a member of their internal medicine staff. Before becoming a physician, she spent 10 years at Draper Labs as a mechanical engineer. . . . The Coolidge Theatre Foundation (Brookline, Mass.) has announced that **Michael Negroponte** has created a new film, *Jupiter's Wife*. This film was done on video in the S-VHS format, and premiered at the Independent Feature Film Market last September.

From our e-mail correspondence, finally word from **Michael Bleiweiss**: "A lot of life goes by in 18 years! After taking an extra senior year to finish a bachelor's thesis in physics, I took a year off to travel, figuring that it would probably be my last chance until I retired. I spent three months traveling around Europe and six months working on a kibbutz in Israel trying to learn Hebrew. I then went to graduate school at the UC/San Diego, intending to be an astrophysicist. However, the universe had other plans for me, and I wound up getting a master's in engineering physics (some day I'll figure out what that means) with a specialty in combustion. My first job was at a small contract research firm in Irvine, Calif., called Energy and Environmental Research, where I studied pollution control schemes for burning all kinds of weird fuels. After two and a half years there, I returned to the Boston area to take a product development job with Sylvania in Salem. After 10 years there, our parent company, GTE, decided that they didn't want to be in the lighting business any more and sold us to Siemens (whose lighting subsidiary is Osram). My department got transferred to Hillsboro, N.H. However, by then I was heavily invested into my local community and didn't care to relocate (I couldn't see feeding much of a theater habit in central New Hampshire). Therefore, I now work as an applications programmer for a company that writes Spectroscopy software called Galactic Industries in Salem, N.H. This means that I get to commute 40 miles from Salem to Salem every day. It seems like a physics degree can take you almost anywhere. I'm still single, but that hasn't kept me from having an overextended recreational life

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(or maybe that's why). I play piccolo with the Middlesex Concert Band. We play mostly at concerts in the park summer season, culminated by an annual performance at the Hatch Shell. Also, for the past seven years, I have been booking a summer concert series on the Salem Common. That's it in a nutshell."

Since we last heard from **Rick Bahr**, he and his wife, Molly, "have been graced by the arrival of three wonderful daughters: Amelia (5½), Madeline (3), and the newest, Gretchen (8 months). We have been transplanted from Cambridge to California, where I find myself director of engineering for Silicon Graphics high-end platforms. And we live in Menlo Park, actually just a few blocks from fellow classmate **John McConnell** (now at Apple) and a half a town distance from **Marty Deneroff** (also at SGI, living in Palo Alto). Your query arrived while Molly, the kids, and I were on a two-month sabbatical visiting family in Massachusetts and New Jersey, and cows and sheep in Ireland. We rented a farmhouse there and wandered as far from the bustle of Silicon Valley as our minds could allow. As ever, I encourage old friends and comrades visiting the Si Valley to find me at work or play."

It gives me great pleasure to report that in 1995-96 two students received funding from the Class of 1976 Student Aid Fund. Rachel Molinar has been renewed for a third year, and Christopher Leung is a new recipient starting this school year. Rachael is now a senior in Course VII and is applying to medical schools. Christopher is a junior majoring in Course VI-1 and is currently thinking in terms of a master's in EE and a career in industry.

It is with deep regret that I inform you of the passing of **Sheri Abrams** in late October 1995. Our condolences go out to her husband, Michael Greenstein, and family.

As for your secretary, he hopes that 1996 is a healthy and prosperous year for us and that the 20th Reunion in June gives us an opportunity for "Auld Lang Syne," which, given the date these notes are being prepared, seems especially appropriate. In the interim, please write or phone. We always are short of news.—**Arthur J. Carp**, secretary, Quantalitics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523; tel: (516) 295-3632; fax: (516) 295-3230; e-mail: <quantalyc@aol.com>

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Please send news for this column to: **Ninamarie Maragioglio**, secretary 9727 Stipp St. Burke, VA 22105

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Please send news for this column to: **Jim Bidigare**, secretary, 9095 North St. Rd. NW, Newark, OH 43055-9538; tel: (614) 745-2676; fax: (614) 745-5648

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Michael Fasullo and his wife, Cinzia, had a son, Alessio Philip Fasullo, on July 17, 1995. Michael has been awarded a five-year NIH Grant from the National Cancer Institute to study how radiation induces

chromosome rearrangements. The Fasullo live in Oak Park, Ill. . . . **Peter Osterberg** proves that you *can* go home again. He graduated from MIT last August with a PhD in EECS and is now a postdoc there under Professor Jacob White. His long-term goal is to find a faculty position in the EECS department of a U.S. university. . . . **Jeffrey de Roulet's** firm, Architects NW, is "busy, stable, and beginning to make lots of \$\$." I'm throttling back off 75-hour weeks, playing golf again, and looking for Ms. Right (or Ms. Right-Now)." Jeffrey lives in Woodinville, Wash. . . . Last July, **Kenneth Murphy** became chairman of the anesthesia department at Kennestone Hospital in Marietta, Ga., presiding over 21 doctors. He has also begun an MBA program in his "spare time" to learn the business side of medical practice. . . . **Thatcher Root** is an associate professor and associate chair for graduate affairs in the Chemical Engineering Department at the University of Wisconsin-Madison. He and his wife, Jennie, had their first child, Frederick, last September. "This extends to nine the run of male children among our department faculty in the last five years. This includes a son for Doug Cameron, PhD, '86, and twin sons for Regina Murphy, '78, PhD, '88."

John Featherly has worked on the "D-Zero" high-energy physics experiment at Fermilab for the past 10 years. Last spring, Fermilab announced the discovery of the long sought after "top quark." . . . **Daniel Gauger** is back in Cambridge, and is having a great time sailing with the Nautical Association. . . . **Andrew Kobayashi** is back in Kendall Square working for Open Market, Inc., in the "former Thinking Machines building." . . . **Michael Good** moved to the Silicon Valley area last July to work in SAP America's technology center in Foster City, with a focus on making the complex R/3 software system more usable. The virtual reality industry, he reports, was fun but not profitable. His wife, Jo Ann Close, '82, is still working for Analog Devices but at their Santa Clara office. Michael is singing in the Masterworks Chorale in San Mateo and is investigating the musical and theatrical opportunities in the area. . . . **Martin Aboitiz** graduated from a cave to a small office. Maybe someday it will even be cash-positive. Check us out at <www.intermedia.com.ar>. My e-mail address is <martin@intermedia.com.ar>. . . . **Lawrence Berg** is an ear, nose, and throat, and head and neck surgeon in Elgin and Crystal Lake, Ill. He is using the latest technology, including endoscopes and lasers to diagnose and treat snoring and sleep apnea and nasal and sinus disorders.

Diane Peters-Hoskins is now a managing partner of Gensler and Associates, architects in Washington, D.C. . . . **Andrew Weiss** has been appointed president of Vital Images, Inc., the imaging subsidiary of Bio-Vascular, Inc. Andy spent 10 years with General Electric working on strategic planning and business development projects, then spent a year with Marquette Electronics, a patient



D. Peters-Hoskins

monitoring and cardiac diagnostics supplier, as VP for global sales and marketing. He has an MBA from Columbia. . . . **Deborah Mossman** is serving a two-year term on the board of directors of the Society of Women Engineers, representing SWE members in Colo., Kans., Mo., Nebr., Okla., and Wyo. She is an associate professor of civil engineering on the faculty in Kansas City of the University of Missouri-Columbia. . . . That's all for now. Send me some snail mail, or drop me a line at my e-mail address.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374; e-mail: <lowens1@pfizer.com>

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Please send news for this column to: **Kim Zaugg**, secretary, 549 Fairfield Rd., Canton, MI 48188; tel: (313) 981-1785; e-mail: <vayda@erim.org>

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15th Reunion

It's coming! Don't forget to make your plans for the 15th Reunion, June 6-9, 1996. And

remember the Class of '81 renovation fund: we still have a long way to go to get this project fully funded. Every dollar helps.

Author, Author . . . Thomas Misa has been very productive in 1995. In addition to his book *A Nation of Steel: The Making of Modern America, 1865-1925*, Thomas also co-wrote *Managing Technology in Society*.

"**Hokie**" **Dokey . . .** From the Blacksburg, Vir., campus of Virginia Tech we hear from **Rev. Lisa Klein**. Lisa's been the Lutheran campus pastor at Virginia Tech for the last two years. Says Lisa, "I've always wanted to do campus ministry, and I was really excited to get the chance to serve at a school that was so much like that little place we attended in Cambridge. The students here have the wonderful arrogance that we did. My diploma hangs proudly in my office, impressing all who enter. No one expects an MIT educated pastor!" Prior to her stint at Virginia Tech, Lisa was in rural Iowa for five years. But as of February 17, life changes for Lisa. She's to be married to a fellow Lutheran pastor, Steven Goodwin, in the town of Benton, Ky., in "the Land Between the Lakes." Following a honeymoon in Steven's home country of England, she will be returning to Benton.

The Next Wave in Wireless . . . Jim Madsen had a successful '95. At Qualcomm, Inc., the company Jim had been with since graduating Stanford B-School in 1989, Jim headed up the firm's PCS (Personal Communications Services) business development and marketing efforts. Says Jim, "PCS is the next generation of digital wireless services and will radically transform the way we communicate." But Jim at last felt the itch to be entrepreneurial, so he left Qualcomm to cofound NextWave Telecom. NextWave will become a wireless telephone company by bidding on PCS licenses set aside for small businesses. *The Wall Street Journal* reported that NextWave was one of the two largest scheduled auction participants out of 250+ entered. Jim also reports that his wife, Azmina, and children James (10), Ryan (7), and Arden (5) plan to remain in the Del Mar, Calif., area, where the kids are all play-

ing soccer and learning karate. Jim is happy to hear from you via e-mail at <jmadsen@adnc.com>.

Test Pattern . . . Bernie Deitrick informs us that he now tests consumer products for *Consumer Reports*, and has appeared both on TV and in the magazine with the results of his testing. Says Bernie, "I finally feel I'm doing truly useful work."

Change of Practice . . . R.L. Worthington-Kirsch is now section head of interventional radiology at GHS-City Avenue Hospital in Philadelphia. He's also started a World Wide Web site consulting business. Wife Kimberly (Wellsley '82) and R.L. now have four children, making for a very busy life.

Change of Assignment . . . Always glad to hear from **Debye Meadows Galaska**, who reports that she has transferred from Kelly AFB to Randolph AFB, still in the San Antonio area. Debye's still a bioenvironmental engineer in the Air Force. Her five children (there are seven altogether!) are still at home, keeping her and hubby Patrick pretty busy with soccer, piano, Scouts, etc., not to mention homework. Between work and the kids, Debye and Patrick enjoy presenting Marriage Encounter weekends.

Change of Country . . . Last time we heard from **Joy Weiss**, she was based in San Ramon, Calif. Since then, she spent a year with Nortel's Richardson, Tex., office, working on global business processes. Joy has now moved to Vancouver, where she is VP and general manager of Prism Systems, a wholly owned subsidiary of Nortel. Prism designs and sells network and service-management systems to telephone companies. Joy reports that she is "enjoying the change in both work and personal scenery," and hopes to be doing a lot of skiing.

Health Care Provider . . . After completing his residency at Boston Children's Hospital, **Jose Prieto** is now working with the Indian Health Service on the Navajo Reservation in Pediatrics.

More Letters . . . Kudos to **Mark Niemer**, who was recently elected Fellow of the American College of Physicians. Mark continues to practice rheumatology at Medical Associates Clinic in Dubuque, Iowa, but now, says he, "I have more letters after my name—whoopie!" Mark and wife Yasyn recently were the proud parents of son Matthew, who joins sister Elizabeth (4).

Scholarship Update . . . The Class of '81 Scholarship recipients for 1996 have been selected. Jonora Jones, of Houston, is now a senior and had committed to a career in teaching and educational administration. Mario Gonzalez, a sophomore from Hammond, Ind., has entered Course XVI (aero and astro), and is a member of the Society of Hispanic Professional Engineers Foundation.

Finally, yours truly has an announcement: I am finally doing the unthinkable. Yes, I've finally found the right girl and have decided to commit matrimony. It all started last summer at the Viper Room, where I met her: tall, blonde, model/actress, California-girl type. Somehow she saw something in me, haven't figured out what yet, but one thing led to another and soon the bells will ring. Oh yes, her name. It's April. April Pfuhs.—**Mike Gerardi**, secretary, 3372 Olive St., Huntington Park, CA 90255; tel: (213) 587-2929 (h), (310) 553-5050 (w); e-mail: <mimg@jmbm.com>

ClassNotes

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It was great to hear from a fellow Number Sixer, **Melanie Meyers**, this month. After four years as assistant and associate professor at Cardoza Law School, she quit to

become general counsel to the Department of City Planning of New York City, where she uses her architectural studies as well. She teaches a land-use law course at Columbia University and spends her free time doing pottery and modern dance, and enjoying brownstone life in Brooklyn. . . . **Bryan Fortson** runs the Systems Engineering Division Launch Programs at the Air Force's Space and Missile Systems Center at Los Angeles Air Force Base. Michele and Bryan celebrated their seventh anniversary this year along with Andrew (4) and Melissa (1).

Elena Rozier-Gearing and her husband, John, moved from Northern California to Albany, N.Y. There they opened Donninaton Books, a used bookstore in Colonie. Elena is looking at getting back into engineering and meeting MIT alums. . . . **Daniel Grunberg** moved to Lexington, Mass., this past summer after being in Virginia Beach for three years. They look forward to the snow. Daniel does embedded system development at Pixel Magic in Andover. Also at Pixel Magic are **John Iler**, **Doug Chin**, **Steve Yao**, and **Ray Khorram**.

Jeff Marcus returned to MIT in 1987 to start his PhD program. In 1988 he married Susan; in 1992 their son, Caleb, was born, and Jeff received his PhD in EECS and moved back to Montreal, where he works for Bell-Northern Research, managing speech recognition. . . . **Josephine Lee** is assistant professor of English at the University of Minnesota.

Dennis Nash vacationed in the mountains of North Carolina this past summer with the families of **Allen Hollenbeck**, '83, **Mark Deuser**, **Ed Wilcox**, **Al Ringer**, **Jim Murray**, and **Ed Hienle**. Dennis' wife, Lynn, and two daughters are doing well. He is working in Michigan for IBM on integrating sales, marketing, and customer databases to significantly improve business results. He can be reached at <dnash@vnet.ibm.com>.

Dave Medek just celebrated 10 years in sunny Arizona, where he works for Arizona Public Service Co. at the Palo Verde Nuclear Generating Station. He was "reengineered" in August 1994 and now works as a senior engineer in Nuclear Quality Assurance, with oversight responsibility for nuclear fuel management and software quality assurance. He's moving with his significant other, Ann Kessinger, to a new house in Goodyear (just west of Phoenix), where they can enjoy the mountain view from the backyard, and break out the telescope at night without the lights of Phoenix ruining it all. The highlight of 1995 was taking his mother to Ireland for two weeks of go-as-you-please motoring around the country. They stayed primarily in bed-and-breakfasts, but also spent a night in a restored 13th-century castle. And, yes, he did hang upside-down like a bat to kiss the Blarney Stone!—**Helen Fanucci**, secretary, 502 Valley Forge Way, Campbell, CA 95008; e-mail: <fangroup@aol.com>

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This is the type of column your secretary dreams about. No creativity needed, there is plenty of news. . . . **Linus Kelly** writes that his daughter, Emma Mary Kelly, was born in April 1994. He says she has beautiful curly hair and the cutest smile. Linus has transferred from Allied Signal Aerospace to Allied Signal Automotive, where he is working on process improvements in a marketing and distribution business in Rhode Island. . . . **Michelle and John Webster** are enjoying their first year in the Washington, D.C., metro area. John is leading software development at General Electric and is planning on starting an MBA at Duke in January. . . . **Lee Marzke** writes that he has recently been hired as software engineering manager at Smiths Industries/Aerospace in Malvern, Pa. He is leading the design of new generation LCD displays for corporate and transport aircraft.

Stuart Rubin writes that he is assistant professor of radiology at the University of Rochester School of Medicine and Dentistry, as well as attending radiologist at Strong-Memorial Hospital. Stuart is married to Lisa Rubin and has two children, Matthew (3) and Daniel (8 1/2 months). . . . **Joseph Iano** writes that he is a practicing architect in Boston and has served as a visiting lecturer at MIT. Joseph recently cowrote the *Architect's Studio Companion*, second edition, in September 1995. . . . **Christopher Dunmeyer** writes that he and his wife, Patty, had a child, Alexander Ryan Dunmeyer, in August 1995. Christopher also has a pilot's license.

Kimberly Elcess writes that she has completed an MBA at INSEAD in Fontainebleau, France, and has since joined Strategic Decisions Group in the London office, where she is a management consultant specializing in decision consulting. . . . **Steven Elliot** has worked in various positions in manufacturing and process development at Intel in Santa Clara, for five years. In 1992, Steven went back to law school and just started as an associate at Cravath, Swaine, and Moore in New York. . . . **John Thompson** recently wrote the *Macromedia Lingo Workshop*, published by Hayden in July 1995. John was also a featured spokesman at Multi Jam 1994 in Jamaica, a multimedia conference.

Robert Norwood writes that he and his wife, Mary, just had their first child, Meghan. After six and a half years with Hoechst Celanese, Robert has taken a job as a senior research scientist with Allied Signal in Morristown, N.J., working in the area of optical interconnections and switching. . . . **Jeffrey Lipton** writes that he has been practicing pathology in Brooklyn since finishing a residency in June 1994. . . . **Bruce McHenry** is back at the MIT Media Lab. He writes that MIT is even more fun now that he is 36, than it was when he was 17.

Scott Tse is currently a manager in the aerospace and defense practice of At Kearney, Inc., in Cambridge, MA. . . . **Eric Johnson** has not written in years, so here's the catch up. Eric married Debbie Busk in October 1992. They have a 1-year-old daughter and are currently living in Cumberland, Maine. Both Debbie and Eric work at S.D. Warren, a paper company. The Johnsons recently attended Kathi and Gary Oliverio's wedding in Santa Clara, Calif., which in itself was a Delta

Upsilon mini reunion. . . . **Pace Willison** and **Wendy Rowe** write that Pace is working at home for Opus Telecom and in his spare time does some work for his own company, Blitz Product Development. Wendy is home-schooling their son Eric for first grade, and son Alex is proud to be a "home-preschooler." Wendy is also a library trustee, which may be her first step into public office.

UColorado/Boulder announced that Assistant Professor **Elizabeth Bradley** was



Liz Bradley

cited by the David and Lucille Packard Foundation as among "the most promising scientists and engineers at universities in the United States." The Packard fellowship provides each young faculty member with \$100,000 a year for five years to support scientific research. Elizabeth focuses her research efforts on

creating new computer programs incorporating artificial intelligence to help solve complex engineering-design problems. She is probing the practical uses of chaos theory in her research, combining aspects of applied mathematics, computer science, and electrical engineering. . . . It appears that **Daphne Brown** is running for some political office, at least that is what a small press release from the *Houston Chronicle* states. Perhaps Daphne will give us more details for a future column.

Finally, I am happy to announce that my firm has now entered the 1990s and we have e-mail. Please send news for the column to the address below. And keep those cards, letters, and faxes coming!—**Jonathan M. Goldstein**, secretary, c/o TA Associates, High Street Tower, 125 High St., Suite 2500, Boston, MA 02110; fax: (617) 574-6728; e-mail: cgoldstein@ta.com

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Hi, class members. My deepest apologies for missing the last column. But hey—that means more fun reading today! Here we go:

Wendy Keilin sends this report: "I work for the evil media empire Hearst right near Central Park in mid-town Manhattan: system administration and development on their Web server, serving up on-line versions of their illustrious publications, like *Popular Mechanics* and *Cosmopolitan*. Check it out at <<http://www.hearstcorp.com>>. Upstairs in this very same building is the famous Good Housekeeping Institute. Of course I celebrated the big move with an expensive sushi lunch. This job pays twice as much as my last one (for a fly-by-night financial corporation on the outskirts of exciting Princeton, N.J.), but with commuting and New York taxes and fine Manhattan dining, I will most likely end up poorer than before. I also visited my brother and his wife in Tokyo this year. Two highlights: I was in Nagasaki on the 50th anniversary of the genbaku, and I climbed Mt. Fuji."

Oren Levine is proud to announce that he has gotten married to his longtime partner,

Dorit. They had the wedding at the Elephant Walk restaurant in Somerville, Mass. Among the MIT alumni guests were J. Carl Adams, Eric Alani, and Dan Orange, '85. Oren has also finished an MS in computer systems engineering at Northeastern and is now working at ERG Engineering, a startup in the virtual-reality business.

Here's an update from the airborne **John Einhorn**: "I'm still in the U.S. Navy flying F-14s. I am now a lieutenant commander. After graduating from the U.S. Naval Test Pilot School, I spent three years at Point Mugu, Calif., developing and testing new weapons and weapon systems, including air-to-air missile envelope expansion for the new F-14D. I'm now a member of Fighter Squadron 31, stationed at Naval Air Station at Miramar, Calif., and assigned to the carrier *USS Carl Vinson* (CVN-70). My wife and I live in San Diego."

Jeffrey Berner and **Ann (Classen) Berner** are both working at Boeing (Jeffrey's been there for over 10 years) and are now on the same project. They have two daughters Catherine (2) and Christena (5). The whole family went to see the space shuttle launch last September. Catherine was disappointed when she found out that they only got to watch and not actually ride on the shuttle! ... Continuing our class's mass journey into parenthood is **Nancy (DeFeo) Markuson**, who now shares with her husband Dave the joy of their first child, Kristin, born last August. Nancy is still working at the MITRE Corp. ... And **Melissa Rathmell** writes in to tell us that she is now a first-year medical student at UMass.

I hope everyone had a good holiday season. Drop me a line with an update!—**Jonathan Miller**, secretary, 1708 Plaza Ct., Mountain View, CA 94040; tel: (415) 961-2394; fax: (415) 813-1130; e-mail: <logiduke@aol.com>

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David Bondelivitch reports: "I'm working in Hollywood as a music editor and mixer in the film business. I'm currently working with Randy Edelman on a Jean-Claude Van

Damme movie, *The Quest*, to be released by Universal next summer. I'm also working on a documentary about director William Wellman called *Wild Bill*, which is scheduled to air on Turner Network Television in February. I still teach at USC School of Cinema-Television."

Chiquita White writes: "I was recently promoted to section head for product development at Procter and Gamble. This makes me officially part of the establishment. I've been visiting MIT every week this month on recruiting trips." Chiquita also reports Robert Satcher, '86, is in California where he is working on a residency in orthopedic surgery. Chiquita's sister, D'Juanna, '86, recently relocated to Oakland where she's working as a pediatrician at Oakland Children's Hospital. ... **Ken Katz** has started work for Allied Signal in Olathe, Kans., as a senior manufacturing engineer.

Karen Walrath writes, "I just finished a PhD thesis at MIT in electrical engineering. I'll miss TAing 6.013 and 6.014, and I am looking into teaching positions in the Boston area."

Josh Makower informs us of an investment opportunity: "I have started a company called ExploraMed, dedicated to developing

new medical devices. I have recently left Pfizer Medical devices where I had spent the last six years." If you have ideas or capital, feel free to contact him. ... From **Garth Gehlbach**: "After nine years at Amdahl Corp., I recently changed jobs and industries to Compression Labs, Inc., and the exciting world of video conferencing and compressed digital video. I've joined fellow grads Steve Richardson, '73, and Brian Miller, '86, at CLI and enjoy reminiscing about the 'Tute on those rare free moments. On the homefront, my wife Chris and I are proud to announce the birth of our second daughter, Bridget, born this summer. "Release 2.0" has been all smiles since her third month, providing more than adequate compensation for the difficulties of caring for two."

Mina Park Fader and **Pete Fader**, '83, had a baby boy, **Corey ParkFader**, on October 24, 1995. Corey is also welcomed by his big sister, Shayna, who recently turned 3. Mina will take a few weeks off from her job at The Franklin Mint, where she is director of most nonmanufacturing operations (credit, collections, returns). Pete continues to enjoy the good life as a tenured associate professor of marketing at the Wharton School of the University of Pennsylvania. ... **Bernard Gunther** and wife Jan announce the birth of son **Zachary Daniel Christopher Gunther**. ... **Stephanie Winner** tells us that the startup for which husband Jeff worked, Collabra, was bought by Netscape Communications in November. She is still at Apple working on 3D graphics but now is in the Interactive Media Division. Her fourth daughter is due to arrive on February 2.

Adam Brody writes, "After leaving MIT, I spent over six years at NASA Ames Research Center. There I created several laboratories for pursuing my research interests in spacecraft docking and virtual-reality studies of astronaut rescue. My last two years were spent as the senior human factors engineer for the space station centrifuge facility project. When funding for that project was drastically reduced, I left. After a brief period of consulting, I surfaced in the Human Factors Engineering Group at Pacific Bell, where I have been for a year and a half. Here, I am busy creating a graphical user interface front end for the company's legacy systems. Outside of work, I am very involved in the community. For the past several years, I have served beer at the Small Brewers Festival and served wine at the Mountain View Art and Wine Festival. I have also served on the board of directors of the Mountain View Tennis Club for many years, and I was recently elected president. Currently, I am also on the executive board of the Young Adults Division of the Jewish Community Federation. I also recently began writing a book about my adventures and views of the world. I distribute chapters periodically using e-mail. People appear to be very honored and amused to see their names in 'print.' Someday, I hope to have enough free time to be able to clean the bathroom!"

Andrew Bennett brings us up to date on his life: "I'm still working on a PhD in ocean engineering, with an expected graduation date of June 1996. The subject is 'Feature Relative Navigation for Autonomous Underwater Vehicles' and primarily involves lots of numerical sonar simulation work. Our submarine, the Autonomous Underwater Vehicle *Odyssey II* has been to the Pacific and to Stellwagen

ClassNotes

Bank off Cape Cod. Earlier incarnations of the vehicle have been to the Antarctic, under the Arctic ice cap and to the Juan de Fuca Ridge off the coast of Seattle. Fun stuff! When not slaving away over a hot processor, I am also the (quasi) official model builder (along with my friend Chris Murphy) for the Massachusetts Historical Society. Currently we have a 1/4 scale model of Goddard's Rocket and a 1/32 scale model of the Gee Bee Z racer, both of which were made right here in Massachusetts.

"In February my wife, Joice, '83, and I spent a couple of weeks in Osaka, Japan. We were guests of the Osaka International University. Among other highlights, we toured the earthquake devastated city of Kobe (actually, just the outskirts). The damage was truly amazing. We also got to visit Kyoto and explore all over the greater Osaka region.

True to form, I managed to root out about 10 hobby shops (visiting hobby shops is my hobby) and had great fun visiting them. A hobby is a hobby is a hobby anywhere you go. That was the common language!"

From **Penny Axelrad**: "This is my fourth year as an assistant professor at the UColorado/Boulder, Department of Aerospace Engineering Sciences. My research is focused on GPS, primarily for space applications. I also teach undergraduate and graduate lab courses on GPS. Being a prof has been great, but busy! I also got married in June 1993 to Tim Perley whom I met when I was a graduate student at Stanford. We had a son, Aaron, on May 4, 1995. We're all enjoying life in Colorado and hope to get in more skiing this winter." ... **D. Keith Brezinsky** writes: "I am still working at, but no longer for, Xerox in Rochester, N.Y. I am/have been doing Unix system support for the past four years and was traded to EDS (along with an outfielder to be named later) in the world's largest outsourcing agreement. We are still understaffed and overworked (know any good Unix SAs looking for a job in a nice midsize city), but not so much as before and things are slowly getting organized. My 10th anniversary "at EDS" is coming up on March 3, 1996. My wife, Shari Cyd Goldman Brezinsky, and I celebrated our third anniversary on Halloween. Less recently (June 1995), we each received master's degrees; she in immunology from UPenn and me in manufacturing systems from Clarkson. I am involved with the US FIRST project, a 2.70-like community service program in its fifth year, <<http://usfirst.mv.com>>. The idea is that a sponsor (Xerox, NASA, WPI, etc.) partners with a high school to build a robot. Great deals of fun, work, and reward for anyone with enough good engineers on hand. Woody Flowers is the principal advisor, and Xerox's CEO Paul Allaire is the national chairman. Last year's contest was my first (Xerox's fourth), and the first time that the finals were held in EPCOT. I have a great picture of Woody perched on a contest worker's shoulders during a break, dancing around the stage."

And from **Eric Liebler**: "I'm still practicing law, but am suffering from deepening work-

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holism—largely as a result of my firm making me a partner effective October 1 (1995) of this year. Traditional wisdom is that the job gets easier at that point, but in my view it merely changes—and in some ways becomes more difficult and to this point, even more time consuming. I'm in the market for a house, very likely to be on the west side of Los Angeles. As for other '85s, I keep in touch with **Walter Baker, Ken Conradt, Dan Bodor**, and the ever-elusive **Steve Creighton**. Send news to **Bill Messner**, secretary, 5407 Pocusset St., Pittsburgh, PA 15232; tel: (412) 421-4334; e-mail: <bmessner@cmu.edu>

86 10th Reunion

Please send news for this column to: **Bill Hobbib**, secretary, 5 Cappy Cir., West Newton, MA 02165; e-mail: <mit1986@mitvma.mit.edu> or <billhobbib@aol.com>

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Hope you are having a good spring. Any exciting plans for the summer? Write and let me know. . . . Let's begin with an update: I mentioned that **Simon Garfinkel** and his wife

recently moved to **Martha's Vineyard**. The house (along with a log of its current renovations) can be viewed at <<http://vineyard.net/simon/10spring>>. . . **Christopher Morgen** writes from scenic Findley Lake, N.Y., where he is busy building passenger locomotives for General Electric. In his spare time, he enjoys sailing and snowboarding at nearby Peek-N-Peak. . . **Tom Devlin** and **Karl Ulrich**, '84, have started a company called **New Vector Products, Inc.**, which invents and designs consumer products on speculation, with hopes of selling them to a manufacturer in exchange for a royalty. Tom has also designed a Caller ID product which is currently being marketed by **Magnavox**.

Michael Thomas takes the prize this month for hardship duty. A bit tired of the beaches of Lisbon, Portugal, he volunteered for a 10-week temporary assignment at the American Embassy in Luanda. There, Michael filled in as chief of the political section, and also was political counselor to the U.S. Delegation to the Joint Commission on the Angolan Peace Process. He spent a lot of time coordinating with the U.N. Peacekeeping Mission, the world's largest, responsible for feeding about 1.4 million people. He regularly put in 80-hour weeks, but feels the effort was worth helping Angola's transition away from 34 years of war. He lived in an apartment overlooking the Bay of Luanda, and says that the sounds of gunfire and tracer bullets coursing through the sky were better than fireworks. I am pleased to report that Michael recently e-mailed me to say that he has returned safely to Lisbon.

I was a bit worried when an official-looking envelope arrived from the law firm of **Haggerty and Urbanski**, but it turned out to be the news that **Jim Haggerty** just formed the firm in **Wilkes-Barre, Pa.**, with a longtime friend. The firm is engaged in the general practice of law, with an emphasis on commercial and criminal litigation. Jim returned to **Wilkes-**

Barre, his hometown, after spending the last four years working in a large Boston law firm and living in the Back Bay. Even though he misses his Red Sox season tickets, and being walking distance from Fenway and the Garden (now Fleet Center), he is glad to be back home, as business has been great so far, and he feels that there is really no substitute for working for oneself. Finally, Jim would like to send along a loud and thunderous "Airborne!" to all his fellow Pershing Rifles alumni/ae.

David Weisenberg has not done any engineering work for several years, as he is now a professional actor. He finds, however, that his technical past continues to haunt him. In the month of September alone, David appeared in a science fiction show (*Lois and Clark*), played a science teacher on another (*California Dreams*), and became the spokesman for a new interactive product, "The Interactor," whose ads are scheduled to appear in various computer magazines soon. . . **Stacy Katchman** reports that things are going well: she is still married, still a resident in dermatology, and still has a toy poodle named **Herschel** (after **Herschel Walker**, who has since left the Philadelphia Eagles). She is interested in the whereabouts of **Mary Beth Landrum**. . . **Jae-hee (Kim) Ahn** is married, and has two children, **Perry** and **Kevin**. She works for **CSC Healthcare Systems, Inc.**, as a DBA in Farmington Hills, Mich. Jaehee requests that fellow alumni/ae from the MIT KSA write in with their news. . . **Andrew Sterbenz** is starting his second year at **Fort Sam Houston, Tex.** The Fifth U.S. Army keeps him busy evaluating units from Louisiana to Montana. Andrew saw **Derek Rutherford**, '90, not too long ago. Even though Andrew has almost become a Texan, he claims that he has not yet added "y'all" to his vocabulary.

Alan Meyer has entered the world of consulting. He is the president of **Data by Design, Inc.**, a small client/server systems consulting firm located in **Laurel, Md.** . . **Kevin Bartus** lives in **Toronto**, where he just bought a house with his wife, **Molly Shoichet**. Kevin works for **BCG**, and Molly is a chemical engineering professor at the University of Toronto. . . Further away from the States, **Nikiletta Fouska** has lived in **London** since early 1994. She works for **Oliver, Wyman and Co.**, an American management consulting company, which specializes in the financial services industry. She worked for them in **New York City** after getting an SM in **Course VI** in 1989. After a stint in **Harvard Business School** between 1991 and 1993, she moved to **London** with the firm. **Nikiletta** also spent a year and a half working in **Oslo, Norway**.

Greer Tan Swiston, as usual, has news from the Boston contingent. The Boston chapter of **Chinese Alumni/ae at MIT** had its first outing—apple picking in **Stow, Mass.** **Gene Ng** and **Scott Tse**, '85, were there. The showing at their October event, the **Swiston Annual Pumpkin Carving Party**, was expected to be better, with **Craig Strong**, **Gene Ng**, **Scott Tse**, **Charlene Ying**, '88, **Sharon Chang** and her husband, **Jamey Hicks**, and **Phyllis Krystal** all promising to attend. Greer reports that **Gene Ng** has struck out on his own as an independent software consultant. She expects that he will enjoy the change, as has her husband, **Rob Swiston**, who also recently joined the ranks of independent consultants. **Rob**

most enjoys not having to wear a suit and tie every day. . . . Gina and Stan Oda just bought a house out in the Bay Area. Even though they did not initially want a fixer-upper, when they first saw it, they knew that it was exactly what they wanted. . . . Tom Abell enjoys living in the Bay Area, and has been doing a lot of biking and rollerblading lately. He had a bit of a scare recently as he hit his head and lost consciousness after a mountain biking accident last July. He was flown via helicopter to Stanford Hospital and is back in commission now. He's just glad that he was wearing a helmet. Tom also heard through Pete Scully that Steve Geiger still lives in Moscow, but does not know exactly what he is doing there.

From the world of academia: Alexander C. Chow has started a new job as a clinical assistant professor at the University of Florida College of Medicine Urban Campus in Jacksonville, Fla. . . . John Canfield got an MBA at Stanford last June, and now works for Creative Labs in Silicon Valley. . . . Mike Cuffe and his wife, Row, are both on the faculty of Duke University in the area of internal medicine while Mike finishes his cardiology fellowship there. They recently had a daughter, Megan. Mike would love to hear from his classmates via e-mail: <cuffe@acpub.duke.edu>. . . . Jonathan Aronson recently received a PhD from the mathematics department at Carnegie-Mellon University, and now works there as a visiting assistant professor. . . . Cathy (O'Connell) O'Craven has finished a PhD and is now using functional MRI to study visual perception at Massachusetts General Hospital.

Marjolein van der Meulen has been in California since her graduation from MIT. She got an MS and PhD from Stanford, the latter in 1993 in the area of biomechanics. She remains at Stanford through this summer as a consulting assistant professor in her research group; after that, she will join the faculty of Cornell University as an assistant professor in their mechanical engineering department. She looks forward to being back out east (but not the winters).

Babies! Matthew Kaplan and his wife recently welcomed their baby daughter into their family. Samantha Lynne joins her brother, Ryan Thomas, who is now almost 4, and is thrilled to have a baby sister. . . . Thomas Swengros writes that he is married, and has two children: TJ, born September 1991, and Christine, born May 1994. Tom works as a computer analyst for General Systems, Inc., in Vienna, Va. . . . Tom Kurfess, '86, and his wife, Adriana Kurfess-Pradauda, just had a baby. Rebecca Ann was born on June 20, 1995, weighing 7 lbs. 11 oz. Adriana has been the perfect baby—sleeping through the night since she was six weeks old. . . . Anais Rose Elkins, daughter of Mike, '88, and Cheryl (L'Arrivee) Elkins, was born on September 12, 1995, weighing 7 lbs. 7 oz.; she was born in her amniotic sac (cauled), has lots of dark hair, and was wide-eyed from the start. Cheryl says that Anise has been a good baby, and takes after her dad. Before taking maternity leave from Astra through the end of 1995, Cheryl was busy as manager of product development, with many opportunities to do interesting work over the past two years. Her job has required a good mix of engineering and physical chemistry, as well as a good dose of diplomacy and even some psychology. Cheryl

enjoys the fact that she must interact with many different departments at Astra. Mike works as a software engineer for Dragon Systems, Inc. He enjoys his work, which deals with the development of voice-recognition software.

I feel better now that this is written—I have punted the column for a week. But I have no news left for next time, so keep those messages coming.—Jack Leifer, secretary, 2980 Roses Run, Aiken, SC 29803; tel: (803) 642-3900 (h), (803) 648-6851 (w); e-mail: <leifer@sc.edu> or <mit1987@mitvma.mit.edu>

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I decided to start this column with news of each of my freshmen roommates. I encourage each of you to pick up the phone (or your computer keyboard) and find out what your frosh roommates are up to and send it in for my next column. I have had a very busy few months preparing for a field test of my current project. Part of the field test involves me operating the system on a Navy helicopter. To qualify to fly on a Navy helicopter, I had to pass several swim tests including "the dunker." This involved escaping from a submerged helicopter, turned upside down, while blindfolded and wearing full flight gear including boots. I passed and learned something new about myself—I really don't like swallowing large amounts of pool water.

Now on to the roommates. I saw Carla Kapikian for about an hour on Christmas Eve. She was leaving for the Philippines the next day, where she was going to be a bridesmaid in a friend's wedding. After graduating from Harvard Business School, Carla went to work for Chemical Bank. . . . Cheryl (Sampson) and John Ostrander are celebrating their first anniversary with a trip to the Caribbean. Cheryl just got accepted for a family practice residency at Naval Hospital Camp Pendleton. John is a Navy pilot. . . . Tracy (Blauvelt) and Pat Gabridge adopted a baby girl last year. Kira turned 1 in November. Pat writes, "She is a very social kid and seems to be at her best in front of admiring crowds." Tracy is still at AT&T where she is partially in charge of a major re-engineering project at her center. Pat had a play produced off-off-Broadway in New York at a small theater. During his trip to NYC, he saw Dave and Holly Horriggan and Mike Munoz (who now lives in N.Y.). Pat runs a theater company in Denver and has produced a big five-episode serial play. He is increasingly active in the MIT Club, which showed up in force at his play last spring (75+ MITers were there).

Julie Levine Friedman and her husband are enjoying their baby girl, Rachel Amber, who was born last March. Julie is currently a pathology resident and plans to finish her training in '97. . . . Larry Rosen is living with his wife Laura in NYC and will be chief resident in pediatrics at Mount Sinai Medical Center. Larry wants to congratulate DKE brothers Mike Foley, '87, Mark Condon, '90, and Kurt Glitzenstein on recent marriages. In San Francisco, Larry saw Todd Sachs, '90, who recently received a PhD from Stanford. . . . Stephen Foster is approaching the four-year mark for being in Germany and working for Procter & Gamble. He has enjoyed the chance

ClassNotes

to travel through Europe and plans to spend his next vacation in Thailand. Stephen plans to return to get an MBA.

Stacey Dogan married Gregg Shapiro in Sea Ranch, Calif., in September. Diane Caramore, Alice Kwak, Sooji Lee, '87, Louise Shion Oh, '87, Peter Yu, '85, Michelle Park Tuveson, Dave Tuveson, '87, and Larissa Rodriguez, '89, were all in attendance. The couple went mountain climbing in Ecuador for their honeymoon. Stacey is now back in D.C. working as an attorney. . . . Douglas Chappelle is a lead systems engineer on Boeing AWACS program for theater missile defense. Douglas married Carol Barton, of Minneapolis, in June. . . . Andy Miklich is now with Westinghouse Electric Co. at the Science and Technology Center in Pittsburgh. He is presently researching superconducting circuits for high-speed digital signal processing. . . . Lily Huang is living in Southern California and working at Air Touch Cellular. She married Tom Anderegg, whom she met at Wharton Business school.—Catherine Suriano Singer, secretary, 131 Main St., Andover, MA 01810-3804; e-mail: <singer@mit.edu>

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This month's list of people who should send news: Jessie Dotson, Terrence Donahue, James Kosloski, Michelle Quinton, Michael Romero, and Eric Wong. What are you all up to? If anyone knows about any of these people (or anyone else), please write.

Last March, Alice Paquette transferred to David Anderson's lab at Caltech to continue her graduate work in biology. Alice was previously in the neurosciences program at the UC/San Diego, but will now be receiving a PhD from Caltech. . . . Mike Fincke has been reassigned to Japan to "flight test the brand spanking new Japanese FS-X fighter airplane." Mike will report on his experiences in an upcoming issue. . . . Joan (Fand) Spiegel was married in April 1995, and now lives in San Francisco. Joan recently graduated from the University of Michigan Medical School and is currently a resident at the University of California at San Francisco. . . . Jeff Applebaum reports, "All is going well out here in California." Jeff was married last year, and his marketing business is growing extremely well. He and his wife, Johanna, are expecting their first child.

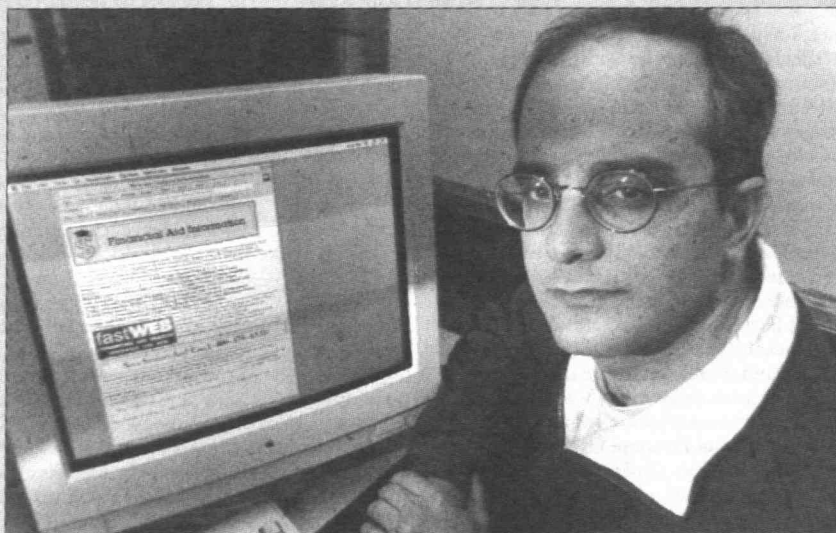
Nick Newman has moved to the metropolitan Detroit area to do his third and fourth years of medical school: "I'm on general surgery this month and I've been very busy (as much as 17 hours a day), but I'm learning a lot and I'm actually having fun for the first time in a long time. Medical school has been long in coming, but it's been worth the wait (so far). After living out in the midwest now for over two years, I'm starting to get homesick for New England (and even MIT if you can believe it)." Nick joined a local masters swim team and hopes to compete in some meets this winter. Nick is beginning to feel a "strong yearning to replace my aging Honda

Mark Kantrowitz, '89: The Pride of Pittsburgh

Mark Kantrowitz, '89 (XVIII, XXIV), has been named one of six outstanding citizens of Pittsburgh for 1995 in a competition sponsored by the *Pittsburgh Post-Gazette*, KDKA-TV, and a local restaurant chain. Kantrowitz, who is a doctoral candidate at Carnegie Mellon University, was honored for his creation of the Financial Aid Information page on the World Wide Web. The page has been

Scholarships and Fellowships for Math and Science Students in 1993.

In 1989, Kantrowitz received the Karl Taylor Compton Prize, MIT's highest honor for undergraduate student service, for his work on such activities as something, something, and something. He continued his activist focus after leaving MIT, last year receiving CMU's Graduate Student Service Award for contributions that included designing a health



up and running since 1994 and has been praised by the likes of *Money* and *Kiplinger's Personal Finance* magazines as the most comprehensive collection of information on the topic available on the Internet.

Kantrowitz has a long history of ferreting out information on awards and scholarships, starting with his own academic career: He started winning first prize for mathematics projects in the Massachusetts State Science Fair in 1982, and he just kept going. "I've received more than \$250,000 in merit awards," he told a writer for CMU's campus newspaper. "My education has cost me and my parents nothing." And he has an almost equally long history of sharing his expertise, including co-authoring the *Prentiss Hall Guide to*

insurance package for graduate students that increased enrollment by 30 percent, proposing a more student-friendly library policy, and establishing the Carnegie Mellon Artificial Intelligence Repository—more than five gigabytes of free software and material on AI.

Kantrowitz says he spends anywhere from 10 to 40 hours per week maintaining his financial aid page, <http://www.cs.cmu.edu/afs/cs/user/mkant/Public/FinAid.html>, adding such details as the latest information on scholarship scams. He estimates that this and other volunteer projects have added years to the time he is taking to complete a PhD on natural language processing and language generation, but he does hope to complete his thesis this spring. □

Accord (American-built, I might add) with something from the Big Three—maybe then I'll stop getting funny looks, but maybe not." Nick also passed along news of some Phi Betes: Gary Gruberth has resumed his graduate work at Cornell after a leave of absence to Indiana where his wife, Corie Gocchicoa (Wellesley '89) is finishing her graduate work. . . Peter Wong has finished MBA and MARCH degrees at Washington University in St. Louis and is working in St. Louis for HOKC. . . Moshin Lee, '88, and Christina Yun (Wellesley '87) live in Ann Arbor. Moshin works for Ford and has been doing his very best to sell Nick Newman a new car, while Christina is finishing her last year of a rehab residency at Detroit Medical Center.

After graduation, Ed Tan worked for Toshiba in Kawasaki, Japan, then moved to Singapore, where he worked for the EDB, the government investment promotional body. Ed is now working as an analyst on the semiconductor industry for Dataquest, a company of Dun and Bradstreet. Ed visited Madison, Wisc., recently, where his wife is working on a PhD. . . Last May, Lori Tsuruda was selected by the the Boston Junior Chamber of Commerce as one of the 1995 10 Outstanding Young Leaders for "making a life out of volunteerism and showing the way to many others." Past outstanding young leaders have included Robert F. Kennedy, Leonard Bernstein, Mortimer Zuckerman, and William O. Taylor. The purpose of the 10 Outstanding Young Leaders awards is to recognize and promote leadership and community commitment by honoring people for their outstanding professional accomplishments, personal development, and community service.

Muriel Medard finished a PhD in EE at MIT in September, and now works at Lincoln Labs. Her husband, John Simmons, '90, is working on an MBA at Sloan. Muriel writes that their daughter, Vivian, "is a lot of fun. She thinks I work with Lincoln Logs. Work is good and it's nice to have weekends to make Halloween outfits and the such." . . . Tom Urban is a full-time staff member at the Applied Physics Laboratory, a division of Johns Hopkins University. "It is very similar to Lincoln Labs at MIT," writes Tom. "I came to JHU/APL because I wanted to get some practical work experience before getting a PhD, but my education benefits are such that I am also now pursuing a PhD in EE at the University of Maryland. School and work can be a lot at times, but hopefully I will manage—I bought a house a few years back, so I cannot go back to school full time."

Marisa Eleanor Tucci-Berube was born, September 14, 1995, to Michael Berube and wife Michele. Marisa weighed in at 7 pounds, 12 ounces. Mike writes, "The labor went as well as labor can go (easy for me to say). We are very excited that Marisa has finally arrived and we are quickly settling into the realities of being parents. It is absolutely wonderful." . . . Nancy Gilman and Jeff Bigler, '87, were engaged recently. Nancy is a product manager for Network Security at Cygnus in the Davis Square office. Nancy and Jeff will be married this upcoming October in the Boston area.

Well, that's it for this issue. Many members of the class have home pages, so be sure to check out the '89 home page at

<<http://www.tns.lcs.mit.edu/mit89/>> and send your URL if you have some info. Please send news.—Henry Houh, secretary, 4 Ames St., Cambridge, MA 02142; tel: (617) 225-6680; fax: (617) 253-2673; e-mail: <hnh@mit.edu> or <henry_houh@mit.edu>

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Well, your neophyte secretary is starting to get the hang of the significant lag time involved in getting the Class Notes to your hot little hands.

For instance, I'm writing this way back in December '95 and you're just now reading it in the April '96 issue! I'll try to make the necessary temporal shifts. . . . Lots of great news this time! **Howard Weingram** is back from London, "where I was working on the rollout of the world's largest equities trading floor running entirely on Windows/NT. Having been personally involved, I'm happy to say that it's not as scary a prospect as it sounds. While I was there I went out to Wembley to watch the Halifax League World Cup (rugby), which I thoroughly enjoyed. Now things get busy, with a number of high-intensity projects coming up." . . . **Tippy "Andrew" Knoedler** graduated from the Air Force Test Pilot school in December. He'll be heading off to Elgin AFB in Florida to work as a test pilot engineer in stores testing for the F16. He and his wife, Audra, visited me at the end of December here in Palo Alto. We had a great time and even relived the old swimming days with a workout! We were joined in our flailing by **Andrzej Skoskiewicz** and **Vijay Lathi**, '93. Tippy and Audra are happy to announce that they are (by the time you read this) six months pregnant with their first child. They are expecting at the end of July. A hearty congratulations! Andrzej is working for Ideo, a product-design company in Palo Alto. . . . **Lesley Redman** writes: "I still live in Chicago. Brrrrrrr. These days, I am an associate attorney at Kenneth Flaxman, P.C., concentrating in civil rights and employment-discrimination litigation. Also I have recently passed the patent bar. In my spare time, I co-chair the Young Lawyers Section of the Chicago Bar Association Women in the Law committee. I connected with my friend and former classmate **Lorraine Wang**. She is an assistant VP at Citibank in New York. More MIT lawyers: **Anne Bomser** recently graduated from BU Law school, and is waiting for the results of the New York bar exam."

Ken Bergenthal has been busy! "After five years in Asia, four in Japan, and one in China, I thought it was time to come back for a while. In September I started a job with Cheyenne Software, Inc., in Roslyn, N.Y., as business development manager for Asia-Pacific. Cheyenne Software is the leader in the LAN backup software market. I'm working like a nut, weird hours, etc., in order to keep up with what's happening in our offices in Japan, Singapore, Taiwan, and China. It's a really interesting job, as I deal with QA right up to the president in all facets from development to marketing and contracts. The company is growing so quickly, we're hiring everywhere. Anyone who is looking for a job or just wants to call to say hi, contact Max for my home number. Both the Japan and China experience certainly gave me a broader understanding of how each nation looks from the other's view-

point. It's really an eye-opening experience! I miss Asia, and am frequently traveling back. The future will probably find me back there some day." . . . **Charrissa** (I'm still working on my thesis) **Lin** writes with some exciting news about **Beverly Saylor**. She was mentioned in a *Time* magazine article about evolution and the Cambrian period. . . . **Alissa Fitzgerald** also wrote in about Bev: "Well, if you haven't heard by now, Beverly is famous! Check out last week's (late Nov/early Dec '95) *Time* cover story. What's totally cool is that she and I were at one of the sites described in the article (in Africa), and we got to see the famous fossils firsthand. At the time, she had told me that the site was a huge find, but I never expected to see it spilling over into the mainstream. Ahh, the thrill of scientific discovery. The rest of us should only hope to contribute that much to human knowledge."

Penn Loh sends the following update: "I wanted to let you all know that there are some big changes coming up for me. First, I just got engaged to Jackie Cefola, and second, I'm moving from Berkeley back to Boston at the end of December. First things first. Jackie and I have been seeing each other for about four and one-half years and this was the right moment to make the commitment, since she just returned to the East Coast (New Haven, Conn.) this past fall to start grad school, a two-year program in the School of Management. She is planning on doing nonprofit management and consulting work. Needless to say, we're really psyched and our parents have been kind of waiting for a long time. I did manage to give her quite a surprise though over Thanksgiving since she wasn't expecting this until after I got back East. No dates or plans yet, but will probably be b/w Christmas and New Years next year (1996) or early summer 1997. I've been working since I graduated for the Pacific Institute in Oakland. I've been doing research at this nonprofit think tank on California water and sustainable development and also on environmental justice issues. It's been good, but I'm ready for a change. I just took a job offer back in Boston for another small nonprofit called Alternatives for Community and Environment. They are a legal and educational support center for community groups working on environmental justice issues in Boston and New England. I'm excited to be working with a group that is much more involved in on-the-ground activities. I'll be doing fundraising, some administrative management, and some programmatic work for them. I hope to be able to catch up with some of you in the coming months." Penn will be moving back in with former ATO brother **Archon Fung** and perennial MIT gad-about, **Dr. Ross Levinsky**, '89, PhD, '94. Archon is working on a PhD in PoliSci at the 'Tute.

Elizabeth (Williams) Brill is now stationed in South Korea with the U.S. Army, serving as a general medical officer. She sends news of **Laura Armstrong**, who has moved back to California semi-permanently and is contemplating B-school, and of **Beth (Schneider) Jarrett**, who had her first child in the summer of 1995 and is in medical school at Michigan. . . . **Mike Westphal** was in the Boston area with his wife, **Michele Sequeira**, '89, in late October of '95. They met up with **Bonnie (Scurlock) Steele**, **Alan Steele**, '91, **John "Pig" Reardon**, **Art Mellor**, '85, and **Russell "Rusty" Devlin**, '89. They would all like to say hello to

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John Olson, '89. . . **Takiko May** is finishing up an MA in English at Auburn and is applying to medical school. She was divorced from **Jerry Sasser**, '91, and has retaken her maiden name. Never give it up, girl! . . . **Shella Farooki** has finished her internship in internal medicine and is now a resident in diagnostic radiology at UCLA Medical Center. "I've been working hard, but I'm enjoying myself. I ran into **Marcelo Fogaca**, who is at UCLA doing a residency in surgery with plans to specialize in plastics. . . . **Jeff Souza** is heavily into water sports. He writes: "I've been traveling, boating, jet-skiing, and launching the new 1996 F-Series for Ford Motor Co." Jeff is in Sandusky, Ohio. . . . **Michael Ni** writes: "After helping Hughes Aircraft restructure themselves for their 'new' commercial customers, I am currently a first-year student at the Harvard Business School developing my more esoteric skills."

More details from the Rajan-Worden front. In June '94, **Anita Rajan Worden** became a U.S. citizen in a ceremony at Faneuil Hall. She's been enjoying the role of president of Solectria which she cofounded with **James Worden**, '89. "With our electric vehicle manufacturing business having grown from a three-person company to one that employs 48 individuals, I have definitely learned quite a lot about personnel management. Fortunately, we have been quite successful getting major-vehicle purchases, and have enjoyed the success of winning large government contracts for major research opportunities." As previously reported here, they were married in March '94. Among the 250 guests were MIT Professor **Gill Pratt**, PhD '90, **Andrew Heafitz**, '91, **Jeff Thompson**, '87, **Sharon Fox**, **Lesley Redman**, and **Olaf Bleck**, '89. Anita adds: "Andrew and Jeff work full time at Solectria. Sharon is working at Miles in Houston, Tex. Lesley (see her news, supra), who got married in '92, is practicing law in the Chicago area. . . . Weddings, I found, are also great occasions to get back in touch with long-lost friends—I heard from **Honor (Jones) Passow** who now lives with her husband **Chris Passow** in Ohio. Honor is teaching and working part time in the same company as Chris. . . . **Koh-Ann Chu** sent her greetings from Hong Kong where she works for the Hong Kong government. . . . I also heard from a number of FWWF (that's McCormick Fifth West) such as **Mavis** and **Michelle Lee**, '88, **Molly Kihara**, '87, **Linda Marinilli**, '87, **Ella Atkins**, '88, **Karin Hollerbach**, '88. Hey you ladies, how about a FWWF reunion!!!"

Christina Schwarz also wrote in with big news: "I'm finally sending news to *Technology Review* for our class! The reason is that I got married last June (10th), and I caught up with some other MIT folks (see photos this page). From left to right: **Ann-Marie Hession** is living in Allentown, Pa., with her husband (they got married October 6 in Boston)—she is still working for Air Products; **Nancy Koay**, '92, is working for the Exploratorium and the Discovery Museum in San Francisco; **Angela Frank**, '91, is working in San Francisco; **Grace Tseng** just started grad school at Stanford—I

believe in industrial engineering; **Jema Gonzales** is working in N.Y.C. for **AT Kerney**; **Kyle Kapuscinski** is in Schaumburg, Ill., working for Motorola; and **Rachel McCarthy** is starting her residency in OB/GYN in Florida! They are doing really well. As for me, I'm starting my fourth year as a grad student at UC Berkeley in science education—it's a great program and I love work. Oh, and my husband, **Steve Zepf**, is a post-doc in astronomy here at UCB. (Unfortunately, he's a Notre Dame alumnus and not an MIT one!) . . . Whew! This was a fantastic issue for news. Keep on sending your missives by snail- or e-mail.—**Max Ochoa**, secretary, Crothers Hall #89B, Palo Alto, CA 94305; tel: (415) 497-6902; e-mail: <mochoa@leland.stanford.edu>, <mit1990@mitvma.mit.edu>

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5th Reunion

Please send news for this column to: **Andrew Strehle**, secretary, 59 Commonwealth Ave., Apt. 4R, Boston, MA 02116, tel: (617) 450-0637; e-mail: **Renee (Mong) Miller**, <miller-rl@post7.laafb.af.mil>

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News from Fidelity about our classmate **Marc Kaufman**—Marc went to work for Fidelity straight from finishing bachelor's and master's degrees in

electrical engineering. He is now managing their Select Electronics Fund. It was the best performing stock fund last year—1995 at \$1.2 billion up from \$300 million when Marc took it over in March 1995. Congratulations on all the success Marc! . . . Navy Ensign **Andrei Perumal** recently reported for duty with the aircraft carrier precommissioning unit John C. Stennis, based at Newport News, Vir. . . . Congratulations to **Ajanta Guha Kumar** recently married to **Akshay Kumar**. Ajanta is currently working for Deloitte and Touche consulting group in Manhattan. She writes that a number of her MIT friends were at the wedding—among them were: **Shiang Yeh**, **Elyta Koh**, **Susan Margulies**, **Mark Dugan**, **Karl Sun**, **Andreas Turanski**, **Chris Prince**, **Mari Madsen**, '93, **Patty Birgeneau**, '93, **Gargi Sircar**, '93, **Charrianna Lin**, '90, **Debbie Moynihan**, '91, and **Bandita Joorde**, '94.

Joe Melvin writes: "Still working for P&G in Frankfurt, Germany. Taking advantage of frequent travel opportunities with **Melissa Norcross**, '91. Our recent weekend excursion destinations include Berlin, the Rhine River Valley, Budapest, and St. Petersburg, Russia. I also had fun with **Kirk Sigel** and **Beth Ahner**, '89, PhD '95, in Munich earlier this spring. Also met up with **Judy Janowitz**, '91, in N.Y.C. last summer. . . . **Colleen Schwingel** accepted a position at American National Can as manager of market analysis. She is now living in Chicago—looking for other MIT alums. Her primary function is to assess international markets for beverage cans, and she expects to be traveling a fair amount in the future. . . . **Charlie Choi**, one of our 2.70 geniuses is still "having fun at Ford engineering the power-

train system on a 2010 concept car." **Charlie** is also working on an MS degree in his spare time, serving his church, and playing lots of tennis.

Maria Nedwidek finished a master of arts in molecular biology in '94 and is working towards a PhD in the same at Princeton. Her work, under **Michael Hecht**, focuses on protein folding, structure, and function. . . . **Teresa Woo** is still working in Hong Kong and has specially requested hearing from: **Barbara Sweet**, **Aroschi**, **Nicole**, **Giovanna**, '94, **Sherry H.**, '90, and **Kay**, '90. I'm guessing that you all know who you are though I do not have last names. I have her e-mail address if you would like it—you can call or write or e-mail me. I have a street address, too. . . . **Ben Pember**, an ordnance officer and legal officer on the guided missile frigate **USS Hawes** (FFG-53), completed a second six-month deployment to the Mediterranean Sea, including operations in support of NATO's embargo against the former republics of Yugoslavia and diplomatic events in Bulgaria and the Republic of Georgia. Ben is leaving the Navy in June and starting an MBA program next fall.

Rodney Register recently transferred with Bell Northern Research to Istanbul, Turkey. Rodney says Turkey is wonderful and that he is enjoying his life as an expatriate very much. . . . **Andrew Liu** is still doing product design in the powerbook group at Apple Computer. He is living in San Francisco and loving it. Andy had visits this summer from **Jon Goetz** and **Austin Sloat**, went white water rafting with **Jon** and **Wayne Lam**, '94, and took **Jon** hiking in Yosemite—17 miles in one day! Wow—what stamina.



The wedding of Christina Schwarz, '90, and Steve Zepf (left) included these MIT alumnae (below, l to r): Ann-Marie Hession, '90, Nancy Koay, '92, Angela Frank, '91, the bride, Grace Tseng, '90, Jema Gonzales, '90, Kyle Kapuscinski, '90, and Rachel McCarthy, '90.



Thanks to everyone for writing so much. Don't forget I am expecting to hear from lots of people now that you can e-mail me.—**Leslie A. Barnett**, secretary, 2644 Vrain St., Denver, CO 80212; tel: (303) 433-4476; e-mail: <labarnet@ouray.cudenver.edu>

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I hope the spring time is treating everyone well. So far I absolutely love medical school at Tufts. I am a student representative to the curriculum committee and that keeps me

busy in my spare time. I know that **Otway Louie** is in his third year here as are **Mary Tchoi** and several other members of our class. Of course, as third years, they are very busy and I have only run into Otway once. After I finished my first semester finals I went to visit **Patty (Birgeneau) Prince** and her husband **Chris Prince**, '92, in Connecticut. Chris is working for Mars Consulting and Patty is attending school full time to get a master's in education so she can become a teacher. After visiting with Patty and Chris, I went to New Jersey to visit my former roommate, **Ajanta (Guha) Kumar**, '92. She is now working for Deloitte and Touche. While I was there I saw her cousin, **Gargi Sircar**, who is living in New Jersey and working in New York doing consulting. I also heard that **Thomas Paul** is working for Goldman-Sachs in New York and that **Ed Wylonis** is also in New York. . . . **Max Metral** is in Boston still. He and three other Media Lab graduates plus a professor have started a company doing personalized intelligent agents on the Web. The company's first product is a "music recommendation service," which can tell you what music you might like based on what you've liked in the past. Max

writes: "... as in most startup situations, I don't have another life. Nonetheless, I wouldn't trade it for anything." ... **Anna Jen** has recently returned from Switzerland after spending three months there working on a project with the chair of Biocompatible Materials Science and Engineering at ETH-Zurich. She enjoyed her experience abroad and is already looking forward to future trips as part of a collaboration between their lab and hers at Rice University. Anna expects to be in Houston for the next two to three years finishing up a PhD, so if anyone plans to be in the area, give her a holler.

Paulo Correia was nice enough to send me an update on himself and some of his friends. First, Paulo has been working at Failure Analysis Associates in Framingham, Mass., for about six months as a mechanical engineering consultant at the time of this writing. He is living in Somerville with Tom Louie, '94, and Mike Decerbo, '95. In June, Paulo is planning to fly out to Northern California and bike down the coast to LA with his good friend Hugh Morgenbesser, '94, for the wedding of **Steve Chamberlin** and Danielle Russell, '96. Paulo also writes: "**Peter Tarsi** is currently finishing his student teaching assignment at South Boston High School, after which he will be accredited as a teacher. He is looking forward to teaching high school physics full time next year. **Amy Rochelle** returned to Massachusetts for a job after getting a master's in material science at UCLA." Paulo sees **Dave LeCompte** on a regular basis, getting together Tuesday nights for "no good reason except to do new things." Their events have included trips to MOM at Jordan's Furniture, The Edge in Framingham, Hilltop Steakhouse, and many films. ... **Amy Chiang** is attending the University of Chicago Graduate School of Business/Joint Certification in Health Administration and Policy. It's part of a new International master's in business administration program. ... **Brian Dunkel** has returned from two years of working in Zurich for Union Bank of Switzerland in order to begin graduate studies at the University of Michigan in Ann Arbor. His goal is a PhD in computer science, concentrating in artificial intelligence and software engineering.

Kathleen Kostival is still up in Ithaca, N.Y., at Cornell University. She received a master's of electrical engineering from Cornell in 1994. Now she is a PhD candidate in food science with a minor in the Johnson School of Management, Nutrition and the School of Hotel Administration. Kathleen also works as a graduate resident assistant/coordinator and is a manager and cofounder of the Illy Cafe Espresso Bar. ... **Cherry Wongtrakool** is in her third year at Cornell University Medical College, in the same year as **Arash Salemi**. Cherry says the transition into the clinical year was an abrupt one, but it is much more satisfying than reading textbooks. At the time of this writing she is in her surgical rotation, but still managed to find time to attend the NYC Young Alumni/ae Club Crawl with **Mia Sakata** and **Sean Dougherty**, '92. She has also run into **Terry Tsai** and **Toni Baker**, '92. ... **Laurence Oliver Ward** is now permanently employed at David Sarnoff Research Center in N.J., working on direct broadcast satellite television transmission. ... Finally, this past August **Bruce Duncan**, a Navy Lt., was designated a Naval Flight Officer while serving

with the Flying Training Squadron, Randolph Airforce Base, San Antonio. He was presented with the "... coveted 'Wings of Gold'" after 18 months of flight training. ... Unfortunately, this is all the news I have for now. Please write in so this column is not bare! Don't rely on other class members to do it for you. I want to hear from YOU! Please tell me what you and your friends are up to. Write or e-mail me today!—**Mari Madsen**, secretary, 85 Alberta Rd., Brookline, MA 02167; e-mail: <mmadsen@opal.tufts.edu>

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Greetings! As always, I enthusiastically encourage sending me details about the latest changes in your life—whether it be marriage, promotion and change in residence, continued education, or merely running into classmates. Speaking of running into classmates—apparently the most common place to run into classmates is Stanford. On this note, **Evan Matteo** <evan@trilogy.com> reports: "I spent last year at Stanford with many others from MIT. Among those who went west: **Alan Liu**, now working at Applied Materials with **Jason Regis**, and **Hans Liemke**, back again at Stanford after a nine-month vacation in the German army. Others I know about are **Mary Casserburg**, working at 3M and doing a master's at UT Austin, and **Brian Christensen**, spending his days playing basketball at Reebok's R&D labs. **Hans Peter Olsen**, the fourth is at Dartmouth Medical School. **Jon Gass**, **Tassos Gianakakos**, and **Sammy Farah** all work at Merck." Evan notes that "I am working for Trilogy Development Group in Austin, Tex." ... **Gloria Ro** continues the Stanford theme by writing: "I'm working at the Defense Intelligence Agency in D.C. now after graduating from Stanford with a TON of MIT people. Way too many people to list! You're always bumping into familiar faces." Gloria also reports that "**Melonie Hall** is studying for quals at Berkeley and **Dolon Das** is at Baylor Medical School."

Abraham Farag reports that "**Matt Manning**, **Gio Gambrell**, and I are all working here at General Motors under the wings of Delphi Chassis. I am working on the braking system for the electric vehicle, Impact, due to save the planet any time now. Matt and Gio are both working on some IC engine cars. I will be following many grads to Stanford next fall." ... Finally, **Heather Klaubert** writes from abroad that, "I'm now at Cambridge University, England, doing a PhD in the Engineering Design Centre. I'm studying the design process used by designers of micromechanisms. I'm conducting participant observer studies, which is great because I get to pretend to be an anthropologist." Heather continues: "I am really loving Britain, now that I've learned to carry my raincoat *everywhere*, rain or shine because it's almost guaranteed to rain later, if it's not already. I was also gratified to know that most of the stereotypes of Britain are actually true, to some extent. Cambridge is wonderfully archaic. Dinner in Formal Hall, for example, at most colleges means you get dressed up, put on an academic gown (looks like an MIT graduation gown, basically), and are served dinner at long wooden tables, sitting on hard wooden benches in a room with dark wood panelling,

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high carved ceilings, and stained glass windows. If you're lucky, you're doing it all by candlelight. Happens several times a week, and beats Lobdell anyway!" ... What's the latest with you? Going to Stanford? Graduated from Stanford? Going abroad? Back? Let me know! Take some time out from your busy schedule and send me a brief note.—**Jeff Van Dyke**, secretary, 6000 Shepherd Mountain Cove #1401, Austin, TX 78730; email: <jvandyke@trilogy.com>

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This episode of Class Notes begins with a report on our class gift. The first recipient of the Class of 1995 UROP Fund is **Dora Farkas**, '98, who will work with Professor

Mario Molina, recipient of the 1995 Nobel Prize in Chemistry, on developing a computer program to calculate future changes in the earth's ozone level. Thanks go to **Jahnvi Swamy**, who works for Procter and Gamble, and to the entire Class Gift Committee for such a successful effort, and to everyone who has contributed to the fund (including our buddy class of 1970). We have made a difference. Remember to mail in your pledge if you have not yet done so—you're helping a very worthy cause.

Some marriage notices: **Bryn Mowry** (who works for MIT's Information Systems) married **David Oh**, '91 (who is one more year away from a PhD), in Los Angeles last June. Attending the reception on a yacht in the Marina del Rey were other ex-Chorallaries directors and members—**Jake Yara**, '93, and **Bill Lin**, '94 (both working in Boston), and **Rich Damaso** (now in Chicago)—so you may imagine several rounds of the Engineers' Drinking Song. Others joining the festivities were **Franis Zane**, '93?, and **Donna Bell**, '91, (who live together in San Diego), **Jeremy Brown**, '94, **Marc Horowitz**, '96, **Michael Oh**, **Jessica Zimmerman**, '96, **Loretta Vidos** (who is engaged to **Nick Pioch**, '94, and is currently in the Course VI MNG program), **Stacy Schlutsmeier**, '96, and **Rosemary Tietge** and **David Smith** (Bold?) (who split their time between New York and Boston). You can see **Bryn** and **Dave's** wedding album at <<http://www.mit.edu:8001/people/bryn/Wedding-Book/title.html>>. ... Wedding bells sounded for **Lynetta Frasure** on June 26, 1995. **Julie Stephens** was in the wedding, and then joined the engineering rotational program at Motorola Semiconductor in Phoenix, Ariz.

Loreli Cadapan is here in Cambridge working on an MNG in Course VI, and I hear she teaches aerobics for the MIT athletic department. ... After finishing a master's in Course III in February, **Lan Hoang** goes to National Semiconductor in Silicon Valley. ... **Ivan Oei** is doing an MNG thesis with Professor **Steve Leeb** on flexible manufacturing, and is "looking for a job—excuse me, a career—no actually, a life!" He lives with **Sumit Basu**, also a Course VI graduate student, and **Raj Sarkar** in Tang. ... **Sahana Sarma** finished an intern-

Puzzle

Continued from Page MIT 55

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|----|----|----|----|----|----|----|----|
| 52 | 61 | 4 | 13 | 20 | 29 | 36 | 45 |
| 14 | 3 | 62 | 51 | 46 | 35 | 30 | 19 |
| 53 | 60 | 5 | 12 | 21 | 28 | 37 | 44 |
| 11 | 6 | 59 | 54 | 43 | 38 | 27 | 22 |
| 55 | 58 | 7 | 10 | 23 | 26 | 39 | 42 |
| 9 | 8 | 57 | 56 | 41 | 40 | 25 | 24 |
| 50 | 63 | 2 | 15 | 18 | 31 | 34 | 47 |
| 16 | 1 | 64 | 49 | 48 | 33 | 32 | 17 |

Other Responders

Responses have also been received from J. Abbott, H. Amster, S. Feldman, M. Garelick, M. Lindenberg, C. Muehe, A. Ornstein, K. Rosato, E. Sard, S. Shapiro, and J. Varnadore.

Proposer's Solution to Speed Problem
Degrees in a Right Angle
Dollars for Passing Go in Monopoly
Sides on a Stop Sign
Blind Mice (See How They Run)
Quarts in a Gallon

ship with Motorola in Japan, and after working in Schaumburg, Ill., on her VI-A master's thesis, she will return to MIT to finish her degree. . . . **Anthony David Patire** worked with Ford last summer, and is now in the MNG program. . . . **Keith Jackson** joined the Leaders for Manufacturing Program. . . . **Jason Sachs** is doing an MNG in Course VI with Professor King of the physics department. . . . **Lee Zamir** spent his summer doing freelance graphic design and photography, and is currently in the MNG program. . . . **Hemraj Sodhi** is finishing a VI-A internship with Motorola SPS and will be interviewing for a job in EE. . . . **Nadir Rahman, M. Becker, and Edward Baik** are all in the Course VI MNG program. . . . **Phil Tracadas** is a grad student in the EAPS Department, but still finds time for about "24 units a week" on renovations of his new apartment. . . . Also at MIT are **Jim Gouldstone**, who is getting a second SB in Course II, **Sherry Wu** in her first year of a five-year nuclear engineering program, and **Charles Chen-Cheng**, pursuing a master's and finishing up a biology degree. . . . After finishing a VI-3 master's in January, **Steve Steiner** plans to join his fiancée, **Amber Dudley**, in Austin, where she is in a master's program in architecture at the University of Texas/Austin. They have set a wedding date of December 26. . . . Best wishes also to **Tammy Stoops**, who plans to marry Samuel Lee Carson (Carnegie-Mellon University '94) of Pittsburgh, Pa., in the fall, after finishing a five-year SB/SM program in nuclear engineering.

Several of our classmates have stayed in Cambridge, though now "up the river": **Henry Cohn** is a graduate student in the Harvard

mathematics department. . . . **Scott Lazerwith** pursues a PhD in chemistry at Harvard. . . . **Nancy-Lorena Torres** attends Harvard Medical School. . . . **Alice Lin** is in the John F. Kennedy School of Government, studying science and technology policy, and enjoying "this side of Cambridge oh so much more!" . . . **Carrie Miller** is in the Harvard Master of Public Policy program; her future plans include paying off loans.

Also in Cambridge is **Howard Pan**, who works for National Economics Research Associates, an economics consulting firm, which is a subsidiary of Marsh and McLennan and is a member of the Mercer Consulting Group. Although he is quite busy there, he also does research for his old advisor on a part-time basis, and studies Japanese at Harvard Extension School. . . . **Ben Serridge** worked at DEC Cambridge Research Lab until Christmas, and then planned to travel for six months in South America with friends. He will then return to complete an MNG in VI-3. . . . **Teresa Esser** is working as an acquisitions editor for Kluwer Academic Publishers <http://www.wkap.nl> in Cambridge. Any environmental engineers with PhDs who have academic transcripts can pass them along to her. . . . Working our way south, **Scott Kesapradist** is in Connecticut working for Southern New England Telephone on the software part of their video-on-demand product. . . . In New York, **Uday Jhunjunwala** works in mergers and acquisitions at Morgan Stanley, **Evelyn Kao** works for Bloomberg, and **Jayanth Kumar** has a management consulting position with Booz-Allen and Hamilton. . . . **Wynne Kwan** is in the city planning master's program at Columbia. . . . After spending his summer bartending in Cancun, **Jonathan Lai** started working for Deloitte and Touche in New York City. . . . **Tracy Back** and **Matt Edstrom** both work for Colgate-Palmolive in New Jersey. . . . At the University of Pennsylvania, **Joyce Espiritu** has started her graduate studies in materials science. She lives on campus without a roommate, but she does "have a kitchen and bath, which means more surface area to clean." . . . **Sheila Jhavar** is in the electrical engineering graduate school at the University of Pennsylvania. . . . After traveling in Europe for four weeks, **Laura Vojvodich** began working for Air Products and Chemicals in Allentown. . . . In Washington, D.C., **Jenny Lee** is a first-year medical student at George Washington University, as is **Bobby Wunnavu**, who has joined the Air Force Medical Service Corps (reserve) and will be a second lieutenant until he graduates. . . . At Duke University, **Rahul Garg** attends medical school. . . . **Cynthia Liu** is at the Medical College of Georgia, in Augusta. . . . Down in Pensacola, Fla., **Brad Brewer** attends the U.S. Navy flight school.

Heading west of Boston, **Catherine Mangion** is at Cornell University's Johnson Graduate School of Management. . . . **Stephanie Ford** and **Astrid Richter** both work for Timken Research in Ohio. . . . **Joe Veys** attends medical school at Ohio State University. . . . At Ford Motor Co. in Michigan, **Caroline Pan** is in a two-year rotation program, and is excited about joining the Explorer/Bronco/Ranger Design Studio, where she will do studio engineering work directly with the designer-artists who make sketches and clay models of concepts envi-

sioned for the next four years. Also at Ford are **Ty Hudson**, who lives in a building near Caroline, **Jen Wozniak**, and **Andy Laures**. . . . Congratulations to **Felicia Moss**, who got engaged to Ari Trachtenberg, '94, last summer. She is working on a PhD in statistics at the University of Illinois in Urbana-Champaign. . . . **Tom Lawrence** is doing his master's in mechanical engineering at Carnegie-Mellon University. . . . **Seth McGinnis** is in the geophysics graduate program at the University of Colorado. . . . Way out west in Oregon, **Mark Story** is doing his VI-A internship at Tektronix. He plans to go to graduate school for a PhD.

Out in California, **Jesse Hull** works for Xerox PARC as part of the VI-A program. . . . **Eric Fong**, **Cerwin Ma**, and **Warren Sze** are all working on their master's degrees in mechanical engineering at Stanford. Also at Stanford are **Kristen Lohman** and **Wayne Pitcher**, who is a first-year graduate student in the chemistry department enjoying the California weather. . . . **Amy Koo** works for Andersen Consulting in San Francisco. . . . **Nicole Wainwright** entered the MS in environmental engineering program at the UC/Berkeley and hopes to earn a PhD in engineering ecology. Also at Berkeley are **Lisa Bailey**, pursuing a master's in mechanical engineering, and **Roderick Diaz**, in the city planning program. . . . **Douglas Shieh** has a VI-A internship at the Jet Propulsion Laboratory in Pasadena, Calif., and will be finishing up his MENG in VI-3. . . . **Fawn Davenport** works for an architect in Pleasanton, Calif., and lives with her fiancé in Fremont. . . . **Steve Hwang** is in San Francisco, working for William Turnbull Associates (known for their design of Sea Ranch), a firm mainly doing residential design work, with **Arley Kim**. He hears that **Tina Gavieres** is in Hawaii but plans to move to LA. . . . **Jiuntow Lin** works for Pei, Cobb, Freed (known for their designs of the Louvre Pyramid, the Rock and Roll Hall of Fame, the Hancock Tower, and many MIT buildings).

Sarah Keightley is in Arizona working in a biochemistry laboratory at the Mayo Clinic, and she says it's nice to have a workday schedule but definitely misses the people and Boston. She hopes to apply to medical schools next year. . . . After taking a long trip to Korea and Hong Kong, **Sookyung Lee** started working at Motorola in Austin, Tex. . . . At the University of Texas in Austin is **Karen Schmitt**, who is doing graduate work in civil engineering, with both an NSF Fellowship and a fellowship from the University of Texas College of Engineering. She misses Boston, her friends, and the intensity and quality of the MIT education, but is enjoying her research and hopes not to spend too many more 100-degree summers. . . . **Isitri Modak** is in medical school at the University of Texas in Houston, and is happy that she's surviving. . . . **Chitra Viswanathan** is at the Baylor College of Medicine in Houston.

That wraps up another Class Notes. Remember to pass the word along to your friends, and don't forget to send me information. Pictures are great too, so send some my way; they will be returned to you, but you may want to send a copy, just in case.—**Ranjini Srikantiah**, secretary, 21 Beacon St, Apt. 2T, Boston, MA 02108; e-mail: <srikantiah@idx.com>

CourseNews

CIVIL AND ENVIRONMENTAL ENGINEERING

Theodore Von Rosenvinge IV, SM '80, reports: "I started GeoDesign, Inc., a geotechnical engineering consulting practice in Middlebury, Conn. I'm living in Ridgefield, with my wife and three daughters." . . . John P. Dugan, Jr., SM '68, reports: "I am senior VP and principal in the Glastonbury, Conn., office of Haley & Aldrich, Inc., a geotechnical engineering and environmental consulting firm. I also serve as president of the Connecticut QBS Council, Inc., which promotes the selection of architects, engineers, and land surveyors on the basis of their qualifications, rather than low price." . . . Kenneth S. Hunziker, SM '85, PhD '88, writes: "I am a senior engineer at Boeing Space and Defense, where I am working on fun stuff. I have three wonderful children. I invite old friends and acquaintances to write or call. Seattle is fun."

Robert J. Degon, SM '68, reports: "I am the design project manager for the Motorola

wafer fabrication facility that is being built in Tianjin, China." . . . From Spain, Daniel V. Fernandez, SM '82, writes: "After working for some years as project manager of the Bilbao Metro, I have come back to my former job at the Consorcio de Aguas del Gran Bilbao. I am now in charge of planning and development matters. The research work that I started at MIT in 1981 evolved into a doctoral thesis (1993) and, finally, into a book, *Gestion del Agua Urbana*, on water services financing and management. The book is sponsored by the Spanish Association of Civil Engineers and the Spanish Association of Water Supply and Sanitation Services."

Erik G. Swenson, SM '92, reports: "I have begun law school at the University of Minnesota and will focus on intellectual property." . . . General Joseph P. Franklin, SM '61 (I, XXII), writes: "I retired from the U.S. Army in 1987. I was the CEO of a Spanish business consulting firm from 1987 to 1993, and am now the CEO of Frequency Electronics, Inc."

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MECHANICAL ENGINEERING

Pradeep Rohatgi, SM '63, ScD '64, the Ford/Briggs and Stratton Professor in Materials in the College of Engineering and Applied Science at the University of Wisconsin/Milwaukee (UWM) has been named recipient of



Pradeep Rohatgi

the university's 1995 Distinguished Public Service Award.

Rohatgi was honored for his outstanding service to students, industry, and the community. Specific accomplishments cited for the award include: organizing world-class materials research at UWM, some of which addresses environmental problems by reducing lead in drinking water, creating advanced materials from industrial and agricultural waste, and creating materials to reduce pollution from automobiles; developing joint research programs between UWM and institutions in Europe, Asia, Australia, and Africa, and training students from all over the world in developing socially relevant new materials; advising students and the Students of India Association in multicultural activities; building strong links with industry, especially in Wisconsin, through relevant research, extension courses, televised instruction programs, and the organization of seminars, tours and training for industry representatives at UWM; and helping numerous industries, especially in Wisconsin, solve technical problems and write proposals for federal and state funding. Rohatgi is the originator of, and an internationally known authority on, appropriate and environmentally friendly advanced materials. A native of India, he received a bachelor's degree in metallurgical engineering from Banarus Hindu University in 1961.

S. Gopalakrishnan, ScD '69, reports: "I was elected Fellow of the American Society of



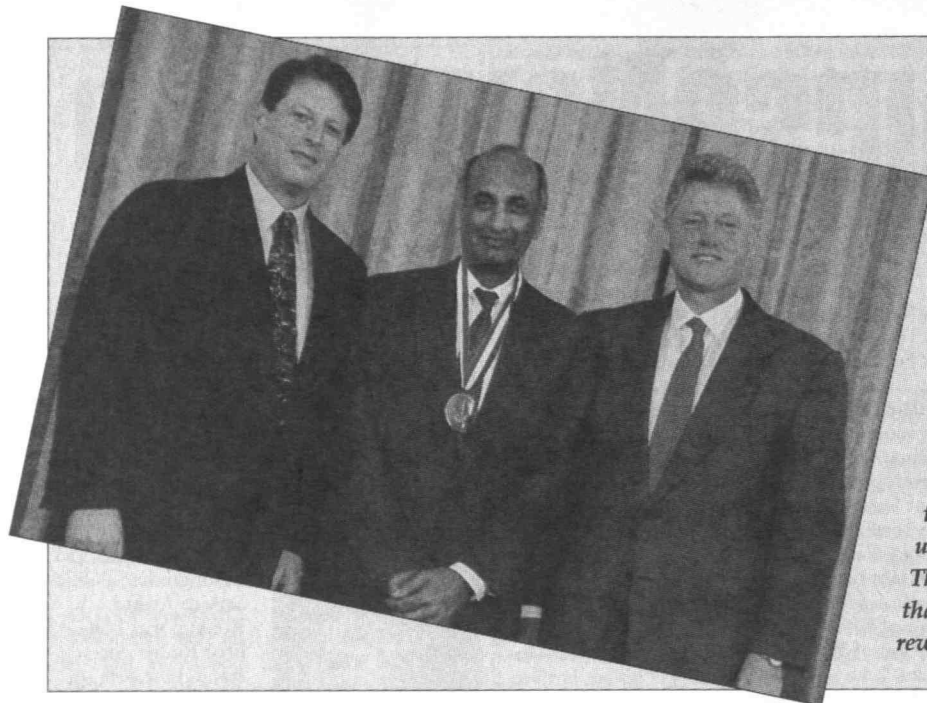
GEORGE SCOTT HIGDON, SM '93, a cartographer, was named one of five outstanding employees with a disability for 1995 at the Defense Mapping Agency (DMA). Higdon has developed software that provides customer access to DMA's CD-ROM products. In his spare time, Higdon is an artist.

DEGREE CODES

AE Aeronautical Engineer
BE Building Engineer
CE Civil Engineer
CHE Chemical Engineer
CSE Computer Science Engineer
DPH Doctor of Public Health
EAA Aeronautical & Astronautical Engineer
EE Electrical Engineer
EGD Doctor of Engineering

ENE Environmental Engineer
MAA Master in Architecture Advanced Studies
MAE Materials Engineer
MAR Master in Architecture
MCP Master in City Planning
ME Mechanical Engineer
MET Meteorologist
MIE Mineral Engineer
MME Marine Mechanical Engineer
MNG Master in Engineering

MPH Master in Public Health
MTE Metallurgical Engineer
NA Naval Architect
NE Naval Engineer
NUE Nuclear Engineer
OCE Ocean Engineer
PhD Doctor in Philosophy
ScD Doctor of Science
SE Sanitary Engineer
SM Master of Science



***P**RAVEEN CHAUDHARI, SM '63, ScD '66 (III), a materials scientist at IBM, was presented with the National Medal of Technology, the United States' highest award for technology innovation, at a White House ceremony on October 18, 1995. Chaudhari, along with two other IBM scientists, was recognized for discovering in the 1970s a combination of elements with unusual magnetic and optical properties. This combination is used to make the film that stores data on nearly all of today's rewritable "magneto-optic" disks.*

Mechanical Engineers in June 1995." ... **In-Joo Chin**, PhD '83, writes: "I am an associate dean of academic affairs at INHA University in Korea and am responsible for admission. I was recently promoted to the rank of tenured full professor of polymers." ... **Koichi Kitazawa**, ScD '72, of Tokyo, reports: "My research interests include high-temperature superconductors, chemical modification of C₆₀, and the magnetic field effect on chemical processes." ... **Thomas P. Moffat**, ScD '89, writes: "Our second son, Benjamin Thomas, was born on September 19, 1995."

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IV ARCHITECTURE

B.D. Nayak, MAR '70, president of B.D. Nayak Architects & Planners, Inc., of Braintree, Mass., was awarded the Distinguished Small Business Accomplishment Award by the Massachusetts Housing Finance Agency in September 1995. In addition to private and state jobs, Nayak is working on the demonstration disposition project, funded by the Department of Housing and Urban Development. ... **Patricia A. Seitz**, MAR '82, writes: "I was the architect for Cybersmith in Harvard Square, a new technology cafe featuring the Internet, virtual reality, and good coffee! My firm, Seitz Architects, designed all the furniture, lighting, lights, layout, etc." ... **Alex Seid**, MAA '74, writes: "I have a new position as the director of development for airport projects at the Ogden Corp., a \$3.6 billion company in New York City. I am responsible for developing airport projects on a privatized basis around the world." ... **Debra A. Adams**, SM '86, develops multimedia authoring tools as a program manager at Microsoft. ... **Susan R. Razzaz**, MAR '87, of Somerville, Mass., is working on a PhD in economics at Brown University. ... **Rod Brana**, SM '85, SM '86, writes: "I live in northern Virginia, with my

wife, Monica, and our sons: Nicholas, 6, and Sebastian, 1. My personalized license plate is 'MIT 86.' Sorry, it is taken in Virginia!" ... **David L. Cohan**, SM '92, writes: "I am now handling acquisitions for Beacon Properties Corp., headquartered in Boston." ... **John Violet**, MCP '64, writes: "I've retired from the federal government and am writing fiction, volunteering at the ACLU, taking yoga classes, watching my garden grow, and generally enjoying life." ... **John Sullivan, Jr.**, MAR '38, reports: "I still play doubles squash, swim, and play piano. I'm taking a course in ceramics. When I had a one-man show of paintings last June, I sold five of them. I have commissions to do watercolor paintings of gardens, houses, and summer cottages. They call me—I don't call them. After Christmas, I plan to return to Australia for the fifth time."

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V CHEMISTRY

Last October 20 and 21, 168 MIT alumni/ae, students, and colleagues attended "Women in Chemistry," a weekend symposium co-sponsored by the MIT Department of Chemistry and the Graduate Alumni/ae Program. The symposium featured several prominent female scientists, who spoke on diverse topics including: innovative research projects being directed by women chemists; industry vs. academia; alternative career paths after graduate school in chemistry; and achieving a successful career and enjoying a rewarding personal life. Alumni/ae speakers included: **Linda J. Anthony**, SM '76 (XXV), PhD '80, of AT&T Bell Labs; **Patricia Bianconi**, PhD '86, of Pennsylvania State University; **Judith Herzfeld**, PhD '72, of Brandeis University; **Jill Netka Mandelblatt**, PhD '92, of Cubist Pharmaceuticals, Cambridge, Mass.; **Cheryl Martin**, PhD '89, of

Rohm and Haas Co., Bristol, Pa.; **Julia Hendrix Miwa**, PhD '92, of Wellesley College; **Michelle Millar**, PhD '75, of SUNY/Stony Brook; **Paula Olsiewski**, PhD '79, of NEO/Tech Corp. in New York City; **Carol Ryerson**, PhD '80, of J&J Clinical Diagnostics, Rochester, N.Y.; and **Judith Selwyn**, SM '69, PhD '71, of Preservation Technology Associates, Inc., in Boston. The symposium was organized by **Melanie Bartow**, **Shari U. Dunham**, **Chris Garrett**, **Natasha Kabloui**, **Rose Koch**, **Danna Leard**, **Martha Rook**, **Linda S. Shimizu**, **Ann Valentine**, and **Seble Wagaw**, graduate students in chemistry at MIT.

Steven J. Gould, PhD '70, is a member of the National Institutes of Health Bioorganic and Natural Products Study Section for 1995-99. ... **David E. Reisner**, PhD '83, is the COO/VP for corporate development at Electro Energy, Inc. in Danbury, Conn. ... **Nathan Tzodikov**, PhD '77, joined Magainin Pharmaceuticals, Inc., in Plymouth Meeting, Pa., where he directs the development program. ... **Steven E. Hall**, PhD '82, of Chapel Hill, N.C., is currently the VP for chemical research at Sphinx Pharmaceuticals, now a division of Eli Lilly & Co., and is involved in the application of combinatorial chemistry to lead generation and lead optimization in drug discovery.

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VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Congratulations to Captain **Steven N. Anastasion**, SM '48, of McLean, Va., who was elected a member of the Engineering Academy of the Czech Republic. ... **Modesto A. Maidique**, '62, SM '64, EE '64, PhD '70, of Miami, writes: "I have just begun my 10th year as the president of Florida International University. During my administration, enrollment has risen 70 percent to more than

28,000 students. We are now one of the 40 largest universities in the country and the largest in South Florida. My son graduated this summer with an architecture degree from Cornell and is now practicing architecture in Miami. Meanwhile, my daughter, a Duke graduate in mathematics, has recently been tapped to head an advertising firm called Spinoff in Coconut Grove, a suburb of Miami. And finally, my wife is enjoying her work as a school psychologist in the Dade County school system." . . . **Steve Foster**, SM '68, writes: "I've been working in Thailand for the past five years, interpreting 3-D seismic data and planning well courses for natural gas production in Unocal's Erawan field. In a 20-year career, this will be my 10th year overseas, previously having worked in Norway, Argentina, and Syria. The company is threatening to transfer me to Houston next year for some sort of 'recalibration.' My wife, Elvira, and I recently celebrated our 25th wedding anniversary. Our son, Eric, is a junior at UC/Davis." . . . **Phil Janson**, SM '74, EE '75, PhD '76, writes: "1995 was a year of transition as I became head of the information technology solutions department at IBM Research Lab in Zürich and was elected to the IBM Academy of Technology." . . . **Ronald L. Curtis**, SM '66, EE '67, writes: "I am a senior electrical engineer at Cray Research, Inc. We just completed a new series of mainframe supercomputers called T90 series systems (4 to 32 CPUs at up to 80 64 gflop max). I developed the power system and controls." . . . **John S. Suen**, SM '82, reports: "My most recent publications include 'Adenotonsillectomy for Treatment of Obstructive Sleep Apnea in Children,' which was published in the medical journal *Archives of Otolaryngology*, and a chapter I co-wrote in the textbook called *Environmental Respiratory Diseases*, 'Epidemiology of Occupational and Environmental Lung Diseases.'" . . . Captain **Russell S. Crenshaw, Jr.**, USN (Ret.), SM '49, writes: "My latest book, *Battle of Tassafaronga*, published by Nautical & Aviation Publishing Co. of Baltimore, Md., is an exciting and revealing analysis of this spectacular

night battle at Savo Island in the Solomons in late 1942. It describes the battle and how it was reported, then analyzes what really happened and discusses the shortcomings of U.S. Navy weapons and the way they were developed and tested. My experience in this battle was one of the main reasons I went to postgraduate school and worked in Navy R&D to help improve naval weapons." . . . **Stephen Jatras**, SM '52, retired chairman and president of Telex Corp., was inducted into the Oklahoma Hall of Fame in November. He also holds degrees from Carnegie-Mellon University and the Stanford Graduate School of Business. Over the years, he has donated one-half mile of land along the Arkansas River for the Tulsa park system and 80 acres for the west campus of Tulsa Junior College. Jatras acknowledged the role education has played in his life: "I was fortunate to get a good education and without that I doubt I would be standing here tonight."

The Association of Alumni and Alumnae was notified that **Frank Moderno Sanger**, SM '48, of Falls Church, Va., died on January 13, 1990. He was retired. No further information was provided.

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VI-A INTERNSHIP PROGRAM

Early December '95 and a relatively quiescent period near the end of the fall term as I write; fewer bits of news than usual.

A memo from VI-A Director **Markus Zahn**, '67, SM '68, EE '69, ScD '70, establishes the dates for selecting the VI-A Class of '96. The annual orientation lecture, company & student open houses, annual VI-A dinner, and company interviews will be over by the time this appears in print. I'll report those activities in detail in future columns.

For the second consecutive year, three MIT students have been awarded Marshall Scholarships for study in Great Britain; and for the second consecutive year one is a VI-A alumnus: **Ben Y. Reis**, who pursued his VI-A work

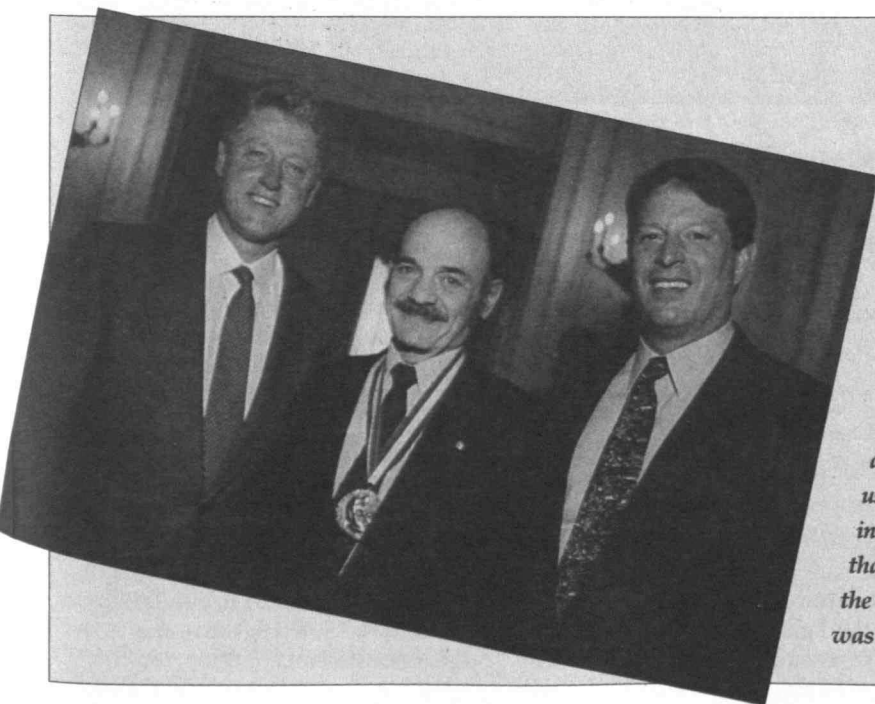
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at AT&T Bell Labs.

Three VI-A grads are listed in the IEEE Boston section's December 1995 issue of *The Reflector* for talks they'll be giving. **Roderick Hinman**, '88, SM '89, PhD '94, of Solectria Corp., will provide "A View to the Future of Electric Vehicles" to the Worcester, Mass., section. Hinman joined Solectria Corp. in Wilmington, Mass., in 1994 to design motor drives and other electronics for electric vehicles. **Eric L. Miller**, '90, SM '92, PhD '94, an assistant professor in the Department of Electrical & Computer Engineering at Northeastern University, will present "Multiscale and Stochastic Signal Processing Approach to Inverse Scattering" to the IEEE's Signal Processing Society at MIT's Lincoln Laboratory; and **David H. Staelin**, '60, SM '61, ScD '65, a professor in the Department of Electrical Engineering and Computer Science at MIT, will discuss "Microwave Atmospheric Sounding from Satellites" at the inaugural meeting of the IEEE's Geoscience & Remote Sensing Chapter of the Boston section, at MIT's Lincoln Laboratory (where Staelin also serves as assistant director).

Other IEEE news includes VI-A grad **Thomas D. Higgins**, '49, SM '50, who was elected to Fellow in 1994. Higgins, a resident of Charleston, W.V., retired from Union Carbide Corp. in 1985 and has been doing free-lance consulting on energy economics.

Since writing my previous column, I've come in contact with the following: **Vincent W. Chan**, '71, SM '71, EE '72, PhD '74, a division head at MIT's Lincoln Laboratory, in a chance meeting at Wellesley's Bread & Circus market, where he and his wife were shopping, as was I; **Denice D. Denton**, '82, SM '82, EE '83, PhD '87, professor at the University of Wisconsin, passing through MIT while on business; and **Richard S. Grinnell**, '93, SM



*A*LEXANDER RICH, the William Thompson Sedgwick Professor of Biophysics in the MIT Department of Biology, received the National Medal of Science at a White House ceremony on October 18, 1995. Rich is a preeminent researcher in structural molecular biology. Among his numerous contributions to the field: He led students in 1962 to the discovery of polysomes, the functional units used by cells to translate genetic information into proteins, and he led a team of researchers that discovered in 1979 a "left-handed" form of the basic genetic molecule of life, DNA. The form was named Z-DNA because of its zig-zag backbone.

'93, on campus as a recruiter for PictureTel, where he is now a senior research engineer, and a former advisee of mine who turned the tables and took me to lunch!—John A. Tucker, director (emeritus) and lecturer, VI-A Program, MIT, 77 Mass. Ave., Rm 38-473, Cambridge, MA 02139-4307; e-mail: <jat@fenchurch.mit.edu>.

VII BIOLOGY

Francis O. Schmitt, who headed the MIT Department of Biology from 1942 to 1955, died suddenly October 3 at his Weston, Mass., home at the age of 91. He received a BS in 1924 and a PhD in medical science in 1927 from Washington University. He also studied at the University of California, University College in London, and Kaiser Wilhelm Institute (now known as the Max Planck Institute). He was on the faculty at Washington University before moving to MIT in 1941. He was the first American researcher to use electron microscopy in the field of molecular biology and was especially interested in how nerves function. Upon stepping down as the head of the biology department in 1955, he was made Institute Professor. In 1962, he began to focus attention worldwide on the neurosciences through the Neuroscience Research Program, which he established, with headquarters at the American Academy of Arts and Sciences. He headed the program until 1974, and, in 1981, it moved to Rockefeller University. He was a recipient of the Albert Lasker Award of the American Public Health Association, the Alsop Award of the American Leather Chemists Association, and the T. Duckett Jones Award of the Helen Hay Whitney Foundation. He was a member of a number of scientific organizations, including the National Academy of Sciences and the Royal Swedish Academy of Sciences, and was a lover of classical music.

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VIII PHYSICS

Allan D. Pierce, PhD '62, chairman of the Department of Aerospace and Mechanical Engineering at Boston University, received the Per Bruel Gold Medal for Noise Control and Acoustics from the American Society of Mechanical Engineers (ASME International) during its International Mechanical Engineering Congress and Exposition in November 1995. The medal, honoring a pioneer in the development of highly sophisticated noise and vibration measuring and processing equipment, recognizes eminent achievement and extraordinary merit in the field of noise control and acoustics. Pierce was recognized "for significant contributions to acoustics research and education on the environment, and for professional leadership in acoustics." His technical articles on noise control, sonic booms, sound propagation, and structural acoustics are among the most important ever published in the field. Written as far back as 30 years ago, the articles today are referenced

To Fame and Fortune By Raising Cane



A little tender loving care can sometimes go a long way. But when provided by the father and son team of Mitchell, '50 (II), and James, PhD '75 (II), Hannoosh, the TLC took the form of a brilliantly simple invention

more user-friendly cane and shared his idea with his son. Jim then designed a cane based on a bottom-weighted device. At the bottom of the cane is a rubber pad that absorbs shock and prevents slipping. On top of the rubber pad is a metal weight

that has wires curving outward and upward and then back inward to the cane's shaft. When the cane is disturbed from its vertical position, the force of gravity acts through the center of mass and causes the cane to roll on the surface created by two adjacent wires and return to its upright position.

After building a prototype, father and son filed for a patent, which was granted in 1994. Jim then fine-tuned the cane so that it could be mass manufactured.

The invention began to take off in 1995. First, the Hannooshes won the grand prize in an invention contest sponsored by Ham-

macher Schlemmer, the catalogue company. Not only did they receive a cash prize and trophy, but they may also sell their product through the catalogue. Later in that year, they exhibited the cane at the Inventors Exposition at Epcot Center in Orlando, Fla., and won one of five awards for outstanding creativity. Shortly thereafter, they received a trademark.

The pair have named their company Raising Canes, and hope to market their product, which will retail for approximately \$100, in early 1996. Further information is available from Jim by phone at (203) 675-4708; fax at (203) 675-4710; or e-mail at <jghannoosh@aol.com>. □

—STEPHANIE V. GREPO



Bruce Lehman, the U.S. commissioner of Patents and Trademarks (center), tries out the Hannooshes' invention at the 1995 Inventors Exposition.

that not only aided a family member, but has the potential to help scores of disabled people.

Their career as inventors was triggered by a serious car accident in 1991 that left Eleanor Hannoosh dependent

on a cane while she regained her ability to walk. While attending his wife's rehabilitation sessions, Mitchell watched patients become increasingly frustrated as they continuously dropped their canes. He envisioned a

in engineering curricula throughout the United States. His first job was on the research staff of Rand Corp. in Santa Monica, Calif. In 1963, Pierce joined Avco Corp. as a senior staff scientist. He left industry in 1966 to serve on the faculty of MIT. He was assistant professor from 1966 to 1968 and associate professor from 1968 to 1973. In 1973, Pierce moved to the Georgia Institute of Technology, where he was a professor of mechanical engineering. Three years later, he became Regents Professor. He was appointed to the Leonhard Chair in Mechanical Engineering at Pennsylvania State University in 1988, and, in 1993, returned to Boston. Pierce is a member of the Acoustical Society of America, which in 1981 published his textbook, *Acoustics: An Introduction to its Physical Principles and Applications*. He was named an ASME Fellow in 1986. Pierce is involved in the society's noise control and acoustics division and, since 1993, has served as chairman of its analysis techniques committee. He currently serves on the executive committee. In addition to ASA and ASME, Pierce holds membership in the Institute of Electrical Electronics Engineers and American Institute of Aeronautics and Astronautics. . . . **Gilbert M. Elchinger**, PhD '78, of Nashua, N.H., has been made president of RSA, Inc., of Burlington, Mass. RSA is a division of Radionics, a leading manufacturer of quality medical instruments. RSA develops and markets stereotactic neurosurgical planning and radiation therapy systems. . . . **James Strickland**, PhD '57, of Hudsonville, Mich., writes: "I retired in December 1995 from Grand Valley State University, after 21 years as chairman of the Department of Physics and the last two years as faculty coordinator of a new \$40 million science building." . . . **Henry Stroke**, SM '52, PhD '55, from Scarsdale, N.Y., reports: "I edited *The Physical Review—The First Hundred Years*, a 1,200 page book and CD-ROM containing 1,000 papers from the *Physical Review* considered to have been the most seminal for science and technology. Among the original articles and a dozen overviews of the different fields of physics are contributions by **Herman Feshbach**, PhD '42, and **Victor Weisskopf**. The book was a joint project of the American Physical Society and the American Institute of Physics. If you can't find it at your local bookstore, the AIP can satisfy your thirst for knowledge."

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IX BRAIN AND COGNITIVE SCIENCES

Larry Squire, PhD '69, was honored "for vital delineation of memory systems" by the American Philosophical Society. Squire "pioneered the study of multiple memory systems in the brain and helped lay the basis for the fundamental distinction between declarative and procedural memory storage." In the early 1980s, Squire was one of several investigators who laid the basis for the fundamental distinction between two kinds of memory processes: procedural (or implicit) memory for motor and perceptual skills, and declarative (or explicit) memory for people, places, and things. Squire also argued for the localization

of these memory processes to different brain structures—showing that declarative tasks, which involve the participation of consciousness, require—to an important degree—the hippocampus and the medical temporal lobe system. He made the important finding that the CA1 region of the hippocampus itself is a critical component of the medical temporal lobe memory system. The award included a hand-illuminated certificate and a check for \$15,000.

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X CHEMICAL ENGINEERING

Shintaro Furusaki, SM '64, from Fujisawa, Japan, writes, "I received two awards from the Society of Chemical Engineers of Japan (SCEJ): the Grand Award and the Ikeda Kamesaburo Award. Both awards were for my long-term research on heterogeneous contactors, particularly bioreactors. After serving as VP of SCEJ, I became its president in April." . . . **Yi Hua Ma**, ScD '67, writes: "I am spending eight months in France on sabbatical leave. The first half of my sabbatical involves working with L. Cot of the University of Montpellier on inorganic membrane synthesis and characterization while the second half entails working at LIMSI in Paris with F. Meunier on diffusion in inorganic membranes." . . . **Arunava Dutta**, ScD '85, writes: "I am currently the engineering manager in R&D for OSRAM Sylvania (formerly GTE Products Corp), whose parent company is Siemens AG. Fifteen U.S. patents have been issued to me in various areas of coating technology. The group is composed mainly of chemical engineers focused on suspension coating of thin films of photoluminescent powders." . . . **Robert Hurt**, PhD '87, is an associate professor of engineering at Brown University in Providence, R.I., with research interests in energy and environmental issues. . . . **Rebecca Rossen Davis**, PhD '87, writes: "I am taking time off from chemical engineering to raise our family. Chris and I have two girls, 4 years old and 21 months old, with a boy due in February. I am also working part-time as an independent contractor in desktop publishing/technical writing. Life is very busy!" . . . **Ray Harlis**, SM '50, reports: "We spend the summers in York Beach, Maine, and the winters on Hilton Head Island, S.C. I volunteer at Hospice and other programs in the schools such as "Reach" and "Just Say No." I also mediate between parents and teenagers." . . . From Syracuse, N.Y., **Bernard Chertow**, ScD '48, writes: "Doris and I have traveled the world—all seven continents, the many seas, some with MIT alums. We explored the Arabian Gulf in November/December. I retired from Bristol-Meyers at 65, from consulting with Galson Corp. at 75, and now do as I wish when I wish!"

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X-A PRACTICE SCHOOL

Concerned that last month's report of his retirement from the Florida Engineering

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Society's energy committee might have a ring of finality, **Charles A. Stokes**, ScD '51, describes the full house he still has in his hand: "In addition to remaining on the energy committee as a member to help the new chairman, I serve on advisory boards of the Florida Solar Energy Center (Cocoa Beach), the MIT Technology & Policy Program, and the University of Florida Chemical Engineering Department; and on the board of a solar thermal energy company in Florida that I recently helped refinance. And I continue to operate my consulting business, being concerned nowadays mainly with energy from biomass, control of volatile emissions in fuel transport, alternative motor fuels, and the management of solid waste." Clearly, retirement is not the idea. . . . From Tenafly, N.J., **Robert S. Nahas**, SM '56, reports that after 18 years in process design, planning, and management at Lummus, he is now director of business development at ABB Lummus Global. Lummus, he says, "is the leading technology-oriented contractor in the ABB Group, licensing over 50 processes in petrochemicals and refining." Nahas now is primarily involved in project development and finance in Europe, the Middle East, and North Africa.

Satoshi Mochizuki, SM '67, is busy in Tokyo with the human side of engineering—operating cross-cultural programs to support employees and their families on overseas assignments; developing tests, applicable in many countries, of on-line workers' personality and concentration ability that have helped prevent industrial accidents; and devising ways to identify and measure workers' problem-finding and problem-solving abilities.

From Boulogne, France, **Patrick J. Vayn**, SM '69, complains that he's received no copies of this magazine for the last two years. We've put the Alumni/ae Association's information management team on his case, and we hope that when he receives this issue he'll acknowledge it by telling us something about his life and work in France.

Gilbert Huppert, SM '89, ScD '96, and **Jonathan Tan**, SM '92, PhD '95, have completed their doctorates. Tan's thesis was in process safety and reliability analyses, Huppert's in plasma processing for microelectronics fabrication.

Kevin Parker, SM '95, who was in the inactive ready reserve-educational delay while at MIT, is now on active duty in the Chemical Corps, stationed in Alabama.

Benjamin F. Schlimme, SM '35, who was general manager of the industrial biochemistry department at the Du Pont Co. in Wilmington before he retired and moved to Tucson, Ariz., died in Tucson last August 10.

Send word of your activities to any of the following: Carol Phillips in the SCEP office, MIT, Room 66-309, MIT, Cambridge, MA 02139, <carol@pracschool.mit.edu>; or the undersigned at *Technology Review*, address as below, or fax (617) 258-8778.—**John Mattill**, Room W59-200, MIT, Cambridge, MA 02139.

Unleashing a Whirlwind

BY VINCENT KIERNAN

Some of his critics say he was slandering the memories of U.S. soldiers. Others maintain just the opposite: that he caved in to the demands of veterans groups. But Martin Harwit, PhD '60—who, as director of the Smithsonian Institution's National Air and Space Museum, headed an ill-fated attempt to create an exhibit critically examining nuclear weapons—insists that he was just trying to start a thoughtful nationwide conversation about how and why the U.S. used atomic bombs in WWII.

Unfortunately for Harwit, the conversation ended up being more about him than the issue of nuclear war. The exhibit drew so much criticism from veterans and peace groups—and finally Congress—that the Smithsonian scotched the exhibit, and an embattled Harwit resigned last May.

An astrophysicist by training, Harwit now works in his Washington home, producing a third edition of his popular text, *Astrophysical Concepts*, reflecting on the state of public discourse, and “looking around for interesting things to do.”

As originally conceived, the *Enola Gay* exhibit, named for the plane used to drop the nuclear weapon on Hiroshima, would have included displays and historical documents examining the process Truman used to reach the decision to use the bomb. Documents cited in the planned exhibit suggested that there was little evidence to support Truman's later claim that a U.S. invasion of Japan—rendered unnecessary by the bomb—would have cost this nation one million casualties. The exhibit also suggested that Truman decided to use the bomb, at least in part, to demonstrate U.S. military might to the Soviet Union. And the exhibit highlighted evidence of American racism in the way the war was pursued.

Such suggestions enraged veterans groups who reviewed drafts of the exhibit script. “We were concerned that the valor of the men and women of World War II—particularly in the Pacific—was being dishonored,” says Bill Detweiler, former national commander of the American Legion, which ended up publicly opposing the exhibit.

“We thought it lacked balance and context. . . . The Americans were portrayed as the aggressors and the Japanese as the victims,” says Stephen Aubin, director of

veterans weren't interested in hearing that Truman saw this as a diplomatic weapon,” Harwit says.

Harwit and other museum staff members engaged in extensive discussions with the veterans groups—as well as anti-war groups—on the content of the exhibit. The text of the exhibit was revised repeatedly, which led to criticism from some historians

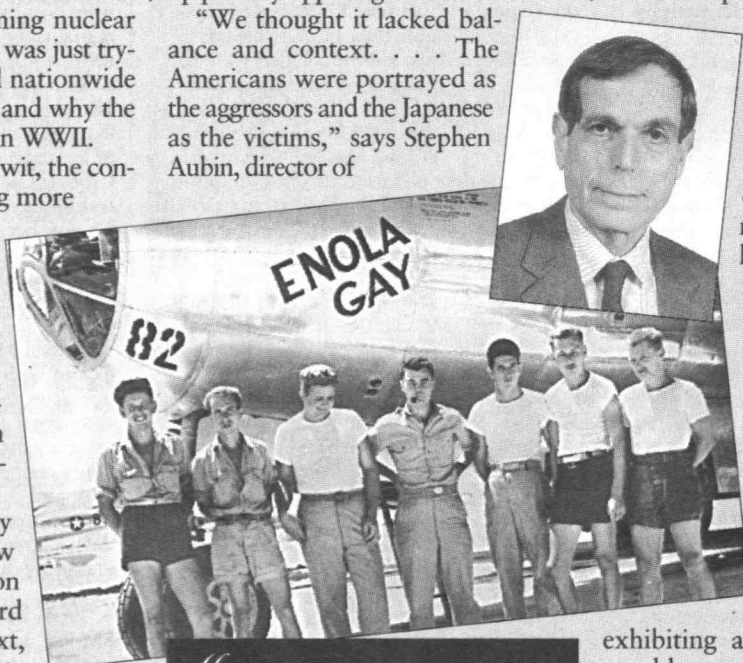
that the museum was sacrificing accuracy to meet the demands of outsiders. Ultimately, negotiations broke down over the question of how many casualties *would* have resulted from a U.S. invasion of Japan.

Harwit says the museum had a delicate task in trying to react responsibly to the needs and concerns of diverse groups in the society. “We wanted to tread a very fine line between the pacifists who would be outraged that we would be

exhibiting at all; the people who would want to do a celebration of WW II; and the Japanese, who really are our allies now,” Harwit says.

He believes members of the public, including veterans, would have been fascinated by the planned exhibit because of its insights into the motives behind the only wartime use of atomic weapons. “But we never heard from the American public. We were always hearing from major lobbying groups. They all had vested interests in the exhibition,” Harwit says.

But the museum under Harwit's leadership actually did a poor job of listening to the public, according to an independent panel that conducted a study in the wake of the *Enola Gay* controversy. The National Academy of Public Administration, which studied the museum at the request of Smithsonian officials, concluded in October that the museum “needs to recognize and pay closer attention to the needs



MARTIN HARWIT, PhD '60, planned an exhibit at the National Air and Space Museum on the nuclear attack on Hiroshima—entitled *Enola Gay* for the plane that carried the bomb—and he believes that the ensuing controversy demonstrated a national refusal to tolerate rational debate on the issue.

communications for the Air Force Association, which also vocally opposed the exhibit.

Harwit remains adamant that the museum's approach was the right one: “The last thing we wanted to do was dishonor the veterans.” He says the exhibit foundered largely because veterans groups refuse to face the historical evidence—admittedly still debated by historians—that Truman's decision to use the bomb was more complex than simply avoiding the mythical million casualties. “The

and interests of both specialized and broader publics, without sacrificing scholarly interests."

Harwit's personal history seems at odds with the criticisms lobbed by his critics. He emigrated to the U.S. in

1946, after his family fled the Nazis from their native Czechoslovakia and went to Turkey. Harwit, 64, is himself a veteran, drafted into the U.S. Army in 1955. As a private who was also a physicist, he was assigned to work on the nuclear tests at Eniwetok and Bikini Atoll in the South Pacific. "He is no left winger," says Frederick Jelinek, '56, PhD '62 (VI), who shared an office with Harwit during their graduate-student days and later served with him on the faculty of Cornell. Harwit moved from Cornell to the museum in 1987.

For his own part, Harwit says he believes Truman's decision to use the



atomic bombs was morally correct. "I would say that he probably made the right decision. It's a horrible thing to say," he admits. He doesn't believe that any of the alternatives that have been suggested instead of the bombings would have ended the war with Japan quickly, nor does he believe that Truman could have headed off the nuclear arms race with the Soviet Union simply by shelving the bomb in 1945.

More generally, Harwit sees the Japanese, not the Americans, as the aggressors in the war. "I think we fought a just war," Harwit says. Japan "certainly had started a very brutal con-

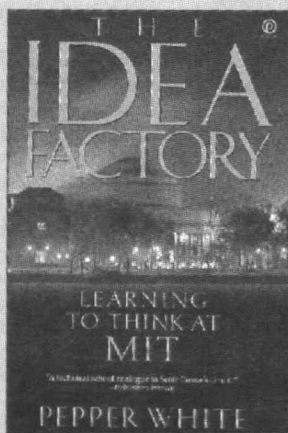
flict in China and the Pacific," including atrocities in the Philippines and China. "At the same time, it was a very vicious war and a very racist war" on the part of the United States as well. "You didn't have that in Europe."

Harwit says the *Enola Gay* controversy illustrates a larger problem in U.S. society—the refusal to discuss issues rationally and the choice instead to rely on incendiary tactics. "There needs to be a willingness to discuss and debate and reach a consensus on important issues. You cannot settle issues in a shouting match."

At root, that is what he was trying to accomplish with the *Enola Gay* exhibit: to encourage informed debate about the use of atomic weapons. "A national museum in a democratically run nation has a responsibility to bring to the public insight into questions that involve national policy," he says. "We're educational, after all." □

VINCENT KIERNAN is a correspondent for *New Scientist* magazine in Washington and was a 1988–89 Knight Science Journalism Fellow at MIT.

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by Pepper White

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XI URBAN STUDIES AND PLANNING

Alexander P. Gamota, MCP '94, writes: "I recently accepted a year-long position as hub project manager at PADCO, Inc., in the Russian Federation on a U.S.-government-funded enterprise land privatization project. I'm responsible for establishing, managing, and overseeing 7 of the 36 project cities in the \$6 million roll-out. Employed by PADCO since graduation, I've carried out and/or managed various U.S.-government-financed assignments in the Russian Federation and Ukraine related to land reform, land development, land privatization, infrastructure pricing and cost recovery, housing development, and local government finance. Other recent highlights include the co-authorship of *A Guidebook to Land Auctions in Ukraine* and being the land auction advisor for the first land auction in Ukraine that sold private ownership rights for the first time since the break-up of the Soviet Union." . . . **Rodolfo Mata**, MCP '94, reports: "I am a law clerk to Justice Peter W. Kilborn of the Land Court at the Department of the Trial Court in Boston. Previously, I served as a zoning project manager for a real estate developer/consultant company servicing the wireless telecommunications industry." . . . **Carol J. Spack**, MCP '81, writes: "In addition to my law practice serving artists, nonprofits, and emerging small businesses, I have the privilege of teaching with Professor Lawrence Bacon in legal topics offered both through DUSP and the Center for Real Estate. I would enjoy hearing from DUSP classmates wherever they might be." . . . **Barbara Fields**, MCP '85, writes: "I currently run the Rhode Island office of the Local Initiatives Support Corp. (LISC) in Providence. Another alum, **Rochelle Bates Lee**, MCP '84, works with me. (Nationally, LISC seems to have its fair share of DUSP alums). I recently received a scholarship to attend a 'concepts in leadership' seminar at the Salzburg seminar in Austria." . . . From Nairobi, **Parviz Towfighi**, PhD '68, reports: "I am working on 'The Impact of Climate Change on Coastal Populations and Human Settlements,' a paper for the United Nations Environment Programme (UNEP) OCA/PAC and the United Nations Centre for Human Settlements (Habitat). It will be used as a background document for a series of UNEP/Habitat joint regional workshops in 1996 and 1997. I spent two weeks in September in Cambridge using the library resources of MIT researching the paper. I would like to take this opportunity to thank Margaret de Popolo for her valuable assistance in my library research." . . . **Melvin Levine**, MCP '56, of Boston, is an advisor to the Faneuil Hall Marketplace Merchants Association. He also is working on revitalization strategies in downtown New Haven, downtown Providence, and six town centers in rural Chenango County, N.Y.

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XII EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

Brian Wernicke, PhD '82, and Joann Stock, '81, SM '81, PhD '88, of San Marino, Calif., had their first baby, Gabriella Michelle Wer-

nicke, in March 1995. . . . **Alfred Julius Garrett**, SM '74, writes: "As a part of the DOE Multi-spectral Thermal Imagery (MTI) Project, I simulate remote-sensing data with a 3-D hydrodynamic code that I developed specifically for that application. These simulations aid exploitation and interpretation of the remote-sensing data." . . . **Stanley J. Laster**, PhD '70, retired from Mobil Oil Co. on September 1, 1995. He is now consulting in geophysics and computer applications.

The Association of Alumni and Alumnae was notified that **Vernon Gaylord Plank**, SM '54, of Mansfield, Mass., a physicist at Hicare Co., died on October 12, 1995. No further information was provided.

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XIII OCEAN ENGINEERING

David Hui, SM '82, a nationally recognized researcher in composite materials, was named Research Professor at the University of New Orleans (UNO), where he is a professor of mechanical engineering. During the three-year term, Hui will have a reduced teaching load so that he may devote more time to scholarly activities. Editor-in-chief of *Composites Engineering* and associate editor of two other prestigious journals, Hui is recipient of many awards, including a fellowship and service awards from the American Society of Mechanical Engineers, certificates of recognition from NASA, and the 1995 UNO Alumni Association Career Achievement Award. Hui, who serves as chair of four technical committees, also takes time to advise numerous graduate students. His externally funded research has been a source of support for many UNO students.

From Norway, **Arne Nestgård**, PhD '85, writes: "I am the chief scientist in the Oslo headquarters of Det Norske Veritas, a leading classification society. I have been involved in several research projects that entailed working closely with the faculty in the Department of Ocean Engineering at MIT. I have had the pleasure to visit the Institute almost annually since I graduated 11 years ago. My main activities have been in the area of loads and response of ships and off-shore structures. I have also been teaching part-time at the University of Oslo." . . . **Rick Schwarting**, SM '83 (II), OCE '83, is repair officer and supervisor of shipbuilding in Portsmouth, Va. He was recently selected for promotion to captain. He continues to work in the navy ship repair sector dealing primarily with private-sector repair facilities. . . . **Harilaos N. Psarftis**, SM '77, PhD '79, of Athens, writes: "I recently completed my two-year term as head of the Department of Naval Architecture and Marine Engineering at the National Technical University of Athens. I am about to start three new research projects in marine transportation funded by the European Commission. Our son, Nicholas, is 1, and our daughter, Anastasia, is 3. I visit Boston once or twice a year." . . . **David S. Greeley**, PhD '82, reports: "After 18 years of consulting—mostly for the U.S. Navy—I joined Bosch Automotive Motor Systems in Waltham, Mass., as the manager of R&D. Most of our work is in automotive

engine cooling modules and HVAC blowers." . . . **William A. Dewey**, SM '74, OCE '74, writes: "Since March 1995, I have been the director of marine operations at Applied Technology, Inc., in Bramerton, Wash." . . . **Commander David L. Stone** (Ret.), SM '82, OCE '82, writes: "I retired from the Navy after 27 years and am now working for Science Applications International Association as a senior systems engineer supporting Navy submarine design." . . . **Henry J. Nardone**, NE '52, reports: "Boots & I celebrated our 50th anniversary on October 2, 1995. I have been busy as chairman of the Westerly Hospital Capital Campaign raising funds for a \$12 million addition to the hospital. I have also been active at the University of Rhode Island as chairman of the engineering school advisory committee and of the university patents committee."

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XIV ECONOMICS

Bryan W. Roberts, PhD '94, writes: "I am currently macroeconomic advisor to the government of Kyrgyzstan and have been working in that country's capital, Bishkek. The work has been fascinating and has touched upon all aspects of economic policy, including macroeconomic stabilization, regional water allocation, and whether to join a customs union. You haven't lived until you've been served a sheep's head in a yurt on the Central Asian steppe." . . . **Merrill J. Bateman**, PhD '65, the presiding bishop of the Mormon Church and a former dean at Brigham Young University, was named the 11th president of the church-owned school. Bateman was formerly dean of the university's business and management schools. . . . **Nicholas S. Perna**, PhD '69, has been named chief economist at Fleet Financial Group. Perna, one of New England's most-quoted economists, was one of two finalists for the job. Perna, who is now based in Hartford, said the new job includes many elements of his former job as chief economist at Shawmut, which has merged with Fleet. The combined company has \$84 billion in assets. "There's enough of the familiar in the new job to make it comfortable," he said. "And enough new things to make it challenging." Perna has degrees from Boston College and MIT and has been an economist for the Federal Reserve Bank of New York and General Electric Co. In 1987, he joined Connecticut National Bank, Shawmut's predecessor, as chief economist. As Shawmut's chief economist, Perna was responsible for making economic forecasts for the company as it made investments for itself and its clients. . . . And last, but not least, a small item in the *Cambridge Chronicle* entitled "Don't go, Solow": "Nobel Prize winner **Robert M. Solow** has tried to retire after 45 years of teaching economics at MIT. However, he will be teaching graduate students this semester one last time. Graduate students waiting until this semester to talk to Solow's Macroeconomic Theory IV convinced their professor that they were 'owed' the class. After this class however, Solow said he is leaving because, 'I

want my department to be able to hire a young person.”

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XV MANAGEMENT



Stephanie Sonnabend

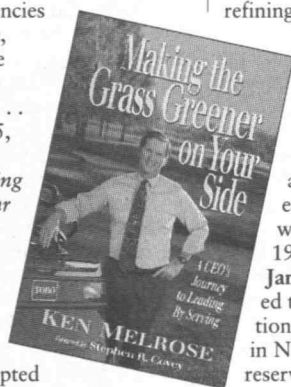
Stephanie Sonnabend, SM '79, was named president of Sonesta International Hotels Corp. of Boston. Since 1993, Sonnabend has served as executive VP of Sonesta. She has been involved in the company's strategic planning, and has supervised the marketing, information technology, and design divi-

sions. From 1984 to 1993, Sonnabend was Sonesta's VP for marketing. Her professional memberships include the Young Presidents Organization, the Boston Club, American Society of Travel Agents, Meeting Professionals International, and Business Executives for National Security. Within the local Boston community, she serves on the board of directors of the Cambridge Chamber of Commerce, the board of trustees of Radcliffe College, and the board of overseers of New England Conservatory. She is a member of the corporation of Lesley College. She is a native of Boston, where she lives with her husband, Gregory Ciccolo, a professional operatic tenor, and their two children, Antonia and Nicholas. . . .

Arnold J. Rothstein, SM '51, reports: "After a year as alumni/ae club VP and another as president, I've slowed down. I am selling my company and am consulting with firms and government agencies here and abroad. My wife, Naomi, and I visit our five married children (and five grandkids). Come visit!" . . .

Kendrick Melrose, SM '65, the chairman and CEO of the Toro Co., wrote *Making the Grass Greener on Your Side: A CEO's Journey to Leading by Serving* (Berrett-Koehler Publishers, 1995). The book jacket describes the work as "the story of how Ken Melrose . . . adopted

a philosophy of leading by serving and made it work in a real-world—and often challenging—situation. His mission as CEO of Toro has been to build an environment that not only serves the needs of the corporation, but also provides a climate for its constituents, the employees, to grow and develop as human beings." Melrose joined Toro in 1970 as director of marketing for the consumer products division. In 1973, he was appointed president of Game Time, Inc., a company subsidiary. He became VP for Toro's outdoor equipment group in 1976 and became executive VP in 1980. He was named president of the company in 1981. In 1983, he became CEO. Four



years later, he was named chairman. Prior to joining Toro, Melrose was at Bayfield Technologies, Inc., and the Pillsbury Co., both in Minneapolis. He holds a BS in mathematics and electrical engineering from Princeton University and an MBA from the University of Chicago. He is an avid white-water rafter.

Frank V. Cespedes, SM '83, reports: "I am now managing partner at the Center for Executive Development in Cambridge, Mass." . . . **Brian Fifer, SM '71**, reports: "I recently 'retired' as chairman and CEO of Aqua Care Systems, Inc., which I founded, and the Public for the Manufacture of Equipment for Water Filtration/Purification and Waste Water Treatment. I just founded Universal Tire Retreading and am building a plant in Florida to recycle waste automotive tires primarily for re-use in asphalt for highways." . . . From New York City, **Faris M. Saah, SM '93**, of CSC Index, writes: "I am getting married in June in Rhinebeck, N.Y., to a Turkish woman named Zeynep Aricanli." . . . **Pramud Rawat, SM '61 (XIII, XV), NA '65 (XIII)**, reports: "Last summer, I organized a seminar on discrete event simulation at the Indian Institute of Technology at Kharagpur. Next fall, I will return there to teach a course in decision modeling and to help establish a center for simulation studies. . . . After 29 years of service, **Robert C. Musser, SM '64**, retired as the controller of Mobil Corp. and the Mobil Oil Corp. in January. Lucio A. Noto, Mobil's chairman and CEO, said: "Bob Musser has given long and dedicated service to Mobil and has made many valuable contributions to our success over the course of his career." Musser began his career at Mobil in 1966 as a financial analyst with the international division in New York. In 1969, he became the manager for special financing in corporate treasurers. Beginning in 1970, he held positions as treasurer for Mobil East, Inc., in New York and then Mobil Europe, Inc., in London. Musser returned to New York in 1975 and, one year later, he was appointed treasurer of the marketing and refining division. After holding a number of

management positions with Mobil, he became the general manager for corporate systems and computer services. He was named controller/treasurer for the marketing and refining division in 1985 and, in 1987, he was appointed controller/treasurer in the exploration and producing division. He was elected controller of Mobil Corp. in 1988. . . . Navy Lieutenant Commander **James F. Reda, SM '83**, recently completed the reserve officer joint military operations course at the U.S. Naval War College in Newport, R.I. Reda was one of 78

reserve officers selected from throughout the country to attend the two-week course. Reda and the other officers participated as members of graduate-level seminars devoted to the study of military warfare from the perspective of a joint task force commander. During the course, Reda studied high-level wartime operations, the challenges of operating side by side with other services, and the uses of the military in support of national security strategy in crisis and in war. Reda joined the Navy in 1971 after graduating from Brooklyn Technical High School. The Naval War College was established in 1884 to enhance the capabilities of its students to make sound decisions in command, staff, and management positions,

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and to develop a sound understanding of strategy. The college is the oldest institution in the world devoted to advanced military studies. . . . **Riva Poor, MCP '68, SM '71**, reports: "This is my 26th year in business. After almost 2,500 clients, I'm very experienced. At what? At helping people make the most important decisions in their lives and in their businesses."

Fleet Financial Group announced that **Glenn T. Migliozi, SM '86**, was named managing director of fixed income investing for Fleet Investment Advisors (FIA), Fleet Financial Group's center for personal and institutional financial investment management, fiduciary, and administrative services to pension funds, profit sharing and 401(k) plans, endowments, foundations, and individuals. Migliozi is responsible for all fixed-income investing, including the development of global capabilities, and will serve as a member of the FIA's investment policy group. Migliozi previously served as managing director of the domestic fixed-income unit at State Street Global Advisors in Boston, which he joined in 1992. "I am extremely pleased that Glenn has joined Fleet and will be a key member of our team. He has the demonstrated ability to design products, invest successfully, and build strong client relationships," said Tom O'Neill, CIO for FIA. After its forthcoming merger with Shawmut, FIA will manage approximately \$45 billion in assets. Prior to that he spent six years with Aetna Life and Casualty, where he held a variety of positions, including director of corporate finance in the treasurer's department. He also has worked for Chemical Bank, National Westminster Bank, and the Comptroller of the Currency. Migliozi is a 1981 graduate of the State University of New York.

Lance E. Murrah, SM '85, was promoted to senior staff VP reporting to Paul Richman, chairman and CEO, from staff VP with management responsibility for the SMC Transformation and Reengineering (STAR) Project. His initial focus will be on the system products division's sales and marketing functions and he will also spend one day a week acting as a liaison in connection with the STAR Project. Prior to becoming staff VP, Murrah was divisional VP for marketing of the system products division. During his 10 years with SMC, he has held other positions including director of international sales for the system products division. He has a BS in industrial engineering from Louisiana State University.

Telephone and Data Systems, Inc., (TDS) has announced the appointment of **Scott H. Williamson, PhD '82**, as VP for acquisitions. Williamson will also work on selected wireless corporate development projects for United States Cellular Corp., the nation's seventh largest cellular company. Williamson has held executive-level senior management positions in Northwest Industries, ITTEL Corp., and most recently, FMC Corp., where he served as VP for corporate development. Williamson holds a BA and a BS from Princeton University. He lives with his wife and two sons in Winnetka, Ill. TDS is a Chicago-based telecommunications company with cellular telephone, local



Mujid Kazimi, SM '71, PhD '73, head of the MIT Department of Nuclear Engineering, gives a pep talk to graduate-student callers before the department's annual telethon. Eleven callers solicited nearly \$8,000 in pledges in three hours. During the 1995 series of departmental telethons, sponsored by the Graduate Alumni Program, 295 callers raised \$231,901 in pledges.

telephone, and radio paging operations.

Steven Paul Somes, SM '83, VP of State Street Research and Management in Boston, died October 18, 1995, of heart failure in Salt Lake City while on a business trip there. He was 37. Born in Portland, Maine, Somes graduated from Bates College in Lewiston in 1980. In addition to being VP at State Street Research and Management, he was manager of State Street Investment Trust in Boston, and was a chartered financial analyst. A resident of Wellesley Hills since 1987, he was a member of the Boston Council of Foreign Relations.

The Association of Alumni and Alumnae was notified that **Jose Ignacio Avellaneda-Navas, SM '67**, of Gainesville, Fla., an historian at the University of Florida, died on June 30, 1995. No further information was provided.

SLOAN FELLOWS

R.E. McKee, SM '83, executive VP for corporate strategy and development at Conoco and senior VP of Du Pont, was named Conoco's executive VP for exploration production. He joined Conoco in 1968 as an associate engineer in the company's New Orleans office. During his career, he has held a variety of domestic and international assignments. In 1988, he was appointed chairman and managing director of Conoco (U.K.) Limited, a Conoco affiliate based in London, and elected a VP of Du Pont. He returned to Houston in 1991 as VP for refining and marketing in North America, and was named senior VP later that year. In 1992, he was appointed executive VP for exploration production and administration, and was named to his current position in September 1994. A native of

Wyoming, McKee received a BS in petroleum engineering from Colorado School of Mines.

... **Charles S. Brown, Jr., SM '92**, was recently named as one of two COOs in consumer imaging at Eastman Kodak Co. ... **R. Daniel Carson, Jr., SM '82**, VP of Appalachian Power Co., was named president of American Electric Power/Virginia-Tennessee. Carson joined the AEP System in 1970 as a civil engineer in the transmission and distribution operations in Roanoke, Va. He has served as VP of Appalachian Power since 1992 and has experience in the company's government affairs, rates, and accounting areas since 1986. He has also served as Abingdon division manager, Roanoke division assistant manager, and administrative assistant to the president of Appalachian Power. Carson is a Pulaski, Va., native and a registered professional engineer. He earned a BS in civil engineering from Virginia Polytechnic Institute and an MBA from Lynchburg College. ... **Daniel A. Carp, SM '88**, currently VP and general manager of Kodak's European, African, and Middle Eastern regions, was appointed executive VP and assistant COO. Carp has been at Kodak for 25 years. "Dan Carp is a results-oriented leader, very strong operationally, with an open style of communication," Fisher stated. "He has an excellent grasp of global growth issues, with a strong focus on customer needs across diverse cultures." Carp holds a BA in quantitative methods from Ohio University and an MBA degree from the Rochester Institute of Technology. ... **W. Frank Blount, SM '71**, president and CEO of Australia's Telstra Corp., was elected a director of Caterpillar, Inc. Blount was elected CEO of Telstra, which provides telecommunications services to Aus-

tralia, in 1992 and has helped transform it from its former monopoly in Australia into a leading company in that country's new, competitive telecommunications environment. He also has expanded the company's operations into mainland China, Vietnam, India, Indonesia, and other areas. Telstra is an \$11 billion company with about 65,000 employees. "Frank Blount will be a valuable addition to the Caterpillar board," said Caterpillar chairman and CEO Donald V. Fites. "He has made customers and customer service a top priority at Telstra, as we have here at Caterpillar, and brings with him a significant communications background and international business expertise." Blount has extensive experience in telecommunications, having served as an executive for both AT&T and the Bell System. Prior to his election as Telstra's CEO, he was group president of AT&T, then served as president and CEO of the New American Schools Development Corp. under the Bush administration. He also held a wide variety of senior positions in sales and marketing, training and education, and network operations at both AT&T and Southern Bell Telephone Co. An electrical engineer by initial training, Blount also holds an MBA from Georgia State University.

James G. Kaiser, SM '73, president and CEO of Quanterra, Inc., was elected to the company's board of directors. Quanterra, which provides environmental and analytical services, is a joint venture owned by Corning and International Technology Corp. Kaiser assumed his present post at the company in 1994. He was appointed president and CEO of Enseco, Inc. (now Quanterra, Inc.), in 1992 following a post as senior VP and general manager of the technical products division and Latin America and Asia Pacific exports. Earlier, he served as general manager of sales and marketing for Corning France and as manager of new business development. He began his career with Corning in 1968. Kaiser also serves on the boards of the Stanley Works and Sun Co. He has a BA in political science from UCLA and an honorary doctorate in humane letters from Florida A&M University. ... **Teo Ming Kian, SM '86**, is the new chairman of the Telecommunication Authority of Singapore. Formerly, Teo was the permanent secretary of defence development. Teo joined the defence engineering and scientific service of the defence ministry in 1979, and has been the permanent secretary there since September 1992. He chairs both the National Science and Technology Board and the board of directors of Science Technologies Industrial Corp. He obtained first class honors in engineering from Monash University in 1975.

The Association of Alumni and Alumnae was notified that **Hart Monroe King, SM '56**, of Oshkosh, Wisc., died on February 27, 1994; **William Melton Wallace, SM '51**, of Gainesville, Ga., died on May 22, 1995; and **Bruce Frederick Becker, SM '70**, of Bloomfield Hills, Mich., died on April 30, 1993. No further information was provided.

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SENIOR EXECUTIVES

AGCO Corp., a major worldwide agricultural equipment manufacturer, announced that **Robert J. Ratliff, '78**, chairman of the board,

CEO, and president, has signed a long-term contract with the company. AGCO's agreement with Ratliff stipulates that he will continue in his management role at AGCO for eight additional years, whereupon he will reach an age of mandatory retirement. Ratliff, who has been the CEO, president, and a director of the company since its creation in June 1990 and chairman since August 1992, was instrumental in the founding of AGCO. He has directed the strategic growth of the agricultural equipment manufacturer from a \$200 million company in 1990 to projected worldwide annual sales of over \$2 billion in 1995. Ratliff is a director of Kysor Industry Corp. and the Equipment Manufacturers Institute. He is a graduate of the University of Maryland. . . . **Joerg D. Agin**, '88, recently appointed Kodak VP for entertainment imaging markets development, will assume the additional responsibility of VP and general manager of motion picture and television imaging. Agin recently returned to Kodak after a three-year stint at MCA/Universal, where he was senior VP for new technology and business development. According to Kodak's president & CEO, "Joerg Agin is the inside/outside returning to Kodak with entrepreneurial credentials, plus the right instincts for new markets and a sharp technical understanding of traditional and electronic business issues." Agin had served as VP and general manager of Kodak's motion picture and television imaging division for four years before joining MCA/Universal. Prior to that his key roles at Kodak included: general manager of marketing for the mass memory divi-

sion; senior VP and general manager of Verbatim Corp., formerly a Kodak subsidiary; and marketing executive of Sayett Technology, a Kodak venture. Agin is a graduate of the University of Delaware, where he earned a BA in liberal arts and a BS in electrical engineering. He also holds an MBA from Pepperdine University.

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MANAGEMENT OF TECHNOLOGY

Paul Hunter, SM '91 writes that he is now working as network director of PCP PrimeCo, L.P., in Florida. PCP PrimeCo, which is preparing to enter the wireless communications business, is owned by Bell Atlantic Mobile, Nynex Mobile, US West-New Vector, and AirTouch Communications. . . . Via e-mail, **Jeff Peterson**, SM '91 reports that he is now director of strategy technology at Crestar Bank. Jeff says that he uses his MOT experience "to provide a corporate-wide perspective geared toward extracting business value from new technology." . . . **Luis Jimenez**, SM '92 sent us an e-mail greeting from Monterrey, Mexico. . . . **Juan Carlos de Pablo-Olaiz**, SM '92, the assisting manager at Tour & Anderson Control in Spain, visited the Program Office in December. . . . An e-mail from **Masa Tsuchiya**, SM '93, reported that he participated in a small MOT dinner in Tokyo with **Koichi Hagishima**, SM '92, **Sigmund Kvernes**, SM '93, **Yashuhito Hayashi**, SM '93 and **Alberto Agostini**, SM '94. . . . Agostini, SM '94, wrote to tell us that he was promoted

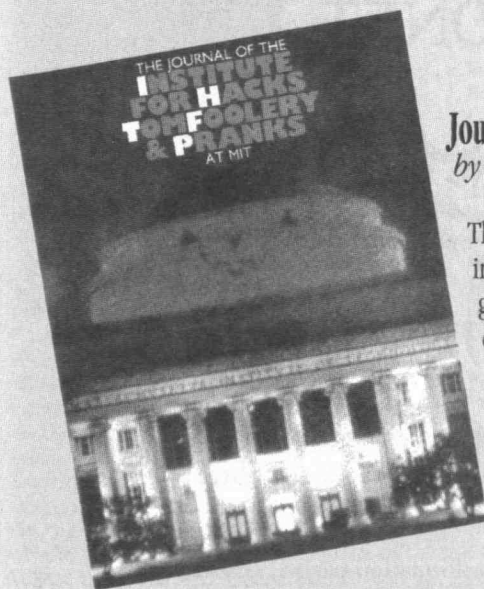
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to pipe factory manager at Tamsa in Mexico. He also happily reports that his second son, Franco, was born in December. . . . From Barington, R.I., **Tom Flanagan**, SM '95 writes that he has started his own company, Molecules to Market, Limited, a behavioral health services firm. . . . **In Kyu Lee**, SM '95, reports that he was transferred to Seoul, Korea, and is working in the Research Laboratory at LG Electronics. He is responsible for establishing the technology strategy of the company and supporting technology alliances with GE Appliances, Hitachi, and Mitsubishi.—**MOT Program**, MIT, Room E52-126, Cambridge, MA 02139; e-mail: <mitmot@sloan.mit.edu>

XVI AERONAUTICS AND ASTRONAUTICS

Commander **Gary A. Napert**, SM '89, of Davie, Fla., reports: "I was assigned as the engineering officer for the U.S. Coast Guard Air Station in Miami, Fla., on June 1, 1995. I pilot HU-25 aircraft and am responsible for nine HH-65A helicopters, six HU-25 Falcon jets, one RG-8A motorglider and one VC-4A (G-1) aircraft. I lead and manage a department consisting of 11 officers and 193 enlisted personnel."

Hack \hak\ *n* 1: A prank, usually elaborate. *v* 1: To perform a prank. 2: To explore the places on campus that are not usually accessible. 3: To work at or study a subject not especially for academic gain.



Journal of the Institute for Hacks, Tomfoolery, & Pranks at MIT by Brian M. Leibowitz

This hilarious book recounts the history, folklore, and ingenuity of MIT students in their quest for the ultimate prank. From the famous Harvard-Yale football game to the Great Dome Pumpkin, this generously illustrated "journal" captures all the spirit and playfulness of the most hilarious tradition in academia. *Paperback, 158 pages, \$19.95*

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Wilson C. Chin, PhD '76, writes: "I've just published my fourth book, on transferring aerospace technology to the petroleum industry. Victoria and I have two kids now, Jessica, 16, and Jonathan, 11. We've successfully adapted to Houston's humidity, but do not yet speak with southern twangs!" . . . John C. Herther, SM '55, is a senior engineer at MITRE Corp. in Bedford, Mass. . . . Ronnie M. Lajoie, SM '87, writes: "I am spending much of my free time on a private project to lower the cost of access to space for individual and student experiments. Project HALO, for High Altitude Lift-Off, will use high-altitude balloons as launch platforms for sub-orbital rockets."

Anthony R. Nollet, SM '51 sends brief word that his wife has died. He is retired. . . . Navy Lieutenant (j.g.) Richard L. Needham, SM '94, recently graduated from submarine officer basic course. During the 12-week course which is taught at the Naval Submarine School in Groton, Conn., students learn about the theory, construction, and operation of nuclear-powered submarines. They also receive instruction concerning damage control, submarine safety, escape procedures, submarine weapons, fire control, and sonar systems. Needham joined the Navy in May 1992.

MIT Professor Jim Kuchar, '90, SM '91, PhD '95, has been selected as the winner of the 1995 William E. Jackson Award by the RTCA for his work on "A Unified Methodology for the Evaluation of Hazard Alerting Systems."

The Association of Alumni and Alumnae was notified that Anibal Becher, SM '44, of

Buenos Aires, Argentina, a vice-commodore in the Argentine Air Force, died on June 26, 1990. No further information was provided.

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>

XVIII MATHEMATICS

From Vienna, Austria, Takemi Chiku, SM '92, reports: "I have started working for the United Nations Office for Outer Space Affairs since October 1993 as political affairs officer." . . . Reid Lifset, SM '87, of New Haven, Conn., writes: "I am a research scholar and associate director of the Industrial Environmental Management Program at the Yale School of Forestry and Environmental Studies. Currently, I am working with John Ehrenfeld, '53 (X), ScD '57 (X), of the Technology, Business & Environmental Program at MIT and David Allen of the University of Texas to launch a new journal on business and the environment, called *The Journal of Industrial Ecology*."

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XVIII MATHEMATICS

Frederic Y.M. Wan, '59, SM '63, PhD '65, was elected Fellow of the American Associa-

tion for the Advancement of Science at the February 1995 meeting in Atlanta.

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>

XX APPLIED BIOLOGICAL SCIENCES

Aaron L. Brody, '51, PhD '57, the managing director of Rubbright•Brody, Inc., an international consulting firm, was inducted into the Packaging Hall of Fame for his contributions to packaging. Known for his pioneering work in frozen precooked foods, aseptic packaging, microwave food heating, and controlled atmosphere food preservation, Brody has worked for General Foods, Raytheon, Whirlpool, Mead Packaging, and Container Corp. of America. He has written seven books, including *Packaging in Perspective*, and more than 200 articles and peer review publications. He serves as the chairman of the Institute of Packaging Professionals' Technology of Packaging Conference and MAPack, The Leading Edge Conference on Controlled and Modified Atmosphere Packaging. He was the Institute of Packaging Professionals' 1994/95 Professional of the Year and the first recipient of the Institute of Food Technologists' Industrial Scientist Award. A resident of Duluth, Ga., Brody is a visiting professor at the University of Georgia. He received an MBA from Northeastern University.

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The Association of Alumni and Alumnae was notified that **Shui-Tien Hsieh**, SM '74, PhD '78, of Brandamore, Pa., died on September 16, 1995. No further information was provided.

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XXII NUCLEAR ENGINEERING

Captain **Frederick H. Hauck**, SM '66, reports: "I am the chair of an independent panel reviewing NASA's preparations for the next Hubble Space Telescope servicing mission in early 1997." . . . **Joe Johnson**, SM '81, PhD '84, writes: "After nearly nine years, I'm still a senior engineer at Astronautics Corp.'s technology center in Madison, Wisc. I'm working on developing magnetic refrigeration and related technologies. In my spare time, I teach computer science at a local college." . . . **Charlie Larson**, ScD '59, reports: "I write 'Conservative Charlie,' a column in Santa Cruz, Calif. I also tutor minority students in an east Palo Alto middle school."

Alumni/ae may send information for *Course News* to <mitalum@mitvmc.mit.edu>

TPP TECHNOLOGY AND POLICY PROGRAM

Jonathan Weiss, '76 (I), '77 (XVII), SM '78, completed his contract in Russia at the end of the year. During the holidays, he vacationed in Southern Africa. . . . **Richard Andrews**, SM '80, is president of EcoScience Produce Systems Corp., a developer and distributor of natural products that preserve and protect fruits and vegetables during storage and shipment. The Orlando, Fla.-based company is a division of EcoScience Corp., which was a biotech start-up in the late 1980s. A third child was due to join Allison, 6, and Melissa, 5, in March. The Andrews family has been living in Orlando for 18 months and loves being out of New England. . . . **Philippe Cothier**, SM '84, is the CEO of Matra Cap Systems, a company with 900 employees and an annual revenue of \$150 million. He was recently honored as an "outstanding young president" with the Challenge Figari-CPA Prize in Paris. He married his wife, Gigi, in 1993, and was also promoted to lieutenant colonel in the Ministry of Defense. Bravo, Philippe! . . . Also from France, **Philippe Martin**, SM '86, left Matra, where he was working with Cothier to serve as the conseiller technique to the delegue general pour l'armement at the Ministry of Defense. Philippe has three children. . . . **Francois Jacques**, SM '85, is VP for corporate strategy at Lafarge Ciments. . . . **Stephen Pinkerton**, SM '85, works at HEC, Inc., an energy services company executing work for Northeast Utilities and the New York Power Co. . . . Through August 1996, **Carolyn Wong**, SM '87, will be at the Brookings Institute as a research fellow. . . . **Hauke Kite-Powell**, '84 (XIII), SM '86 (XIII), SM '88, PhD '92 (XIII), and **Soo Sheung Wong**, SM '91 (MOT) became the proud parents of Johannes on August 20, 1995. Hauke, a research specialist at the

Woods Hole Oceanographic Institution's Marine Policy Center. He is also a lecturer in the MIT Department of Ocean Engineering, where he has taught one or two classes in the fall semester for the past two years. . . . **Jennifer Croissant**, SM '89, is an assistant professor in the Program on Culture, Science, Technology, and Society at the University of Arizona. She is teaching courses called "Technology and Social Theory" and "The Politics of Design" and is working hard to develop the CSTS program as a resource for undergraduate engineering students who want a broader education and the ability to understand the social contexts of engineering work. At the graduate level, she is working to develop a network of minors in various disciplines with the goal of integrating the social studies of science and technology into the humanities and social sciences. She spends her spare time bodybuilding, running, and hiking. Some gymnastics classes are thrown in for good measure.

David Gold, SM '90 (XVI, TPP), started Industry Innovations to provide Internet-based information services to manufacturers in need of identifying, selecting, and contacting consultants and technical service providers. Gold has teamed his company up with a number of associations including Dun & Bradstreet Information Services. Their web site can be viewed at <http://expert-market.com/em/> . . . **Louise and Caleb King**, SM '90 (I, TPP) are pleased to announce the birth of their first child, Sara Louise, on September 30, 1995. Best wishes to all! . . . We've heard through the grapevine that **Robert Moncrieff**, SM '90, was married in early October 1995. . . . **Susan and Bertrand Rigaldies**, SM '90, are expecting their second child in May 1996. Their first child, Jeremiah, is looking forward to being a big brother. . . . **Mark Roberts**, SM '90, continues to enjoy his position as science and technology correspondent at *The Economist*. This past summer, Mark was the science editor for a spell. . . . The third child for Hagette and **M.B. "Tunde" Fafunwa**, SM '92 (XV, TPP) was born in January 1996. Morina and Ibaranz are excited about being older sisters. Best wishes to all! . . . **Ross McNutt**, SM '92 (XVI, TPP) reports that he, Stacey, and Andrew are absolutely thrilled with twins **Joanna Lynn and Catherine Page**, who arrived on November 14, 1995. Congratulations! . . . **Hans Klein**, SM '93, is an assistant professor at George Mason University's Institute of Public Policy. . . . Also at George Mason University, **Chris Hill** (TPP Friend) teaches Science, Technology and Policy.

James Melhuish, SM '93 (I, TPP) joined Ventana Systems, Inc., in Belmont, Mass. . . . **Paul Shawcross**, '87 (XVI), '88 (XXI), SM '93, was promoted to senior program officer at the National Academy of Sciences. He recently published a book on space debris. . . . **Jane Song**, '91 (III), SM '93 (III, TPP) and **Paul Whitworth**, SM '93 (I, TPP) were married on October 7, 1995, in Toronto, Ontario. A traditional Korean ceremony followed in December. Jane is completing her final year of law school. Paul is at Andersen Consulting in New York.

Chris Thomas, SM '93 (I, TPP) is a consultant with the National Economic Development and Law Center in Oakland, Calif., where he is concerned with the impact of technical devel-

CourseNews

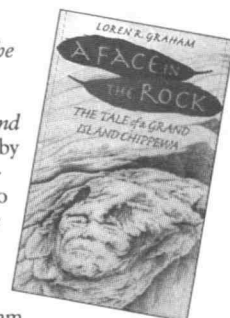
opment on low-income communities, the effects of base closings in California, and the SWAP international student exchange program. . . . **Jason Amaral**, SM '94, is having a great time in the San Francisco Bay Area working for Hewlett-Packard in Palo Alto. He is a manufacturing development engineer at the Electronic Assembly Development Center. In addition to technical cost modeling, his responsibilities include new process development and technology assessment. . . . **Kara Callahan**, SM '94, successfully completed her first marathon on October 22, 1995. She finished the 20th Marine Corps Marathon, which twists and winds through 26.2 miles of Washington, D.C., and Arlington, Va., in 4 hours and 19 minutes. Cheering Kara on were **Alex Hou**, SM '95 (XVI, TPP), **Kristine Cornils**, SM '94 (I, TPP), **Robert Taylor**, SM '94 (II, TPP), and **Ann and Steven Taub**, SM '94 (II, TPP). Congratulations, Kara! Are you in training for the Boston Marathon in April? . . . **Steven Taub**, SM '94 (II, TPP), is on staff in the Development of Environmental Management. . . . On April 25, 1995, twins **Megan and Francesca** were born to **Carla and Frank Felder**, SM '94. Best wishes and please send us a picture! . . . **Christina Houlahan**, SM '94, is leaving New England for Pennsylvania. **Chris, Bart, Molly**, and **Carley** bought a new home and are eagerly looking forward to moving.

Masatoshi Kano, SM '94 (MOT, TPP) joined JGC Corp. as a senior systems engineer in the power plant group. . . . **Judy Hogan-Sheldon**, SM '95 (I, TPP), is a first-year law student at Boston College. . . . **Ulrich Knirsch**, SM '95 (I, TPP), is now at Booz Allen & Hamilton in McLean, Va. working in the transportation division. . . . **Mie and Takaaki Takeuchi**, SM '95 (VI, TPP) enjoyed the beautiful fall season in Japan. Taka works in the information systems department at Tokyo Electric Power Co. . . . **Edmond Toy**, SM '95 (I, TPP) has joined **Andre Cap**, SM '95, **Alice Yates**, '93 (VI), SM '95 (VI, TPP) and **John Weiss**, SM '94, at Industrial Economics in Cambridge, Mass. . . . **Martha Munzer**, '22 (XIV, TPP Friend), has written 11 books in her career. On her next birthday, she will be 97 years old. Martha continues to swim and hike daily.—**Richard de Neufville**, TPP, MIT Room E40-252, Cambridge, MA 02139; e-mail: <ttp@mit.edu>

PROGRAM IN SCIENCE, TECHNOLOGY, AND SOCIETY

A Face in the Rock: The Tale of a Grand Island Chippewa by Loren Graham

Loren Graham, an historian of science who holds a joint appointment in the Department of the History of Science at Harvard University and STS at MIT, was recently published by Island Press. Graham writes in the prologue: "This is the story about the loss of a home, Grand Island in Lake Superior, by a band of Native Americans, members of the Chippewa tribe of the Upper Peninsula of Michi-



gan. It is also the story of the fates of the land and water in that area, and of other creatures that lived there. Both aspects of the story involve death and sorrow, but both also end with rebirth and hope. This story of shadow and light came to me in a personal way, as you will see."

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Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

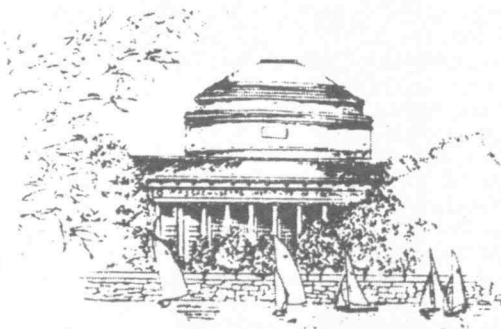
John Frederick Robinson, '22; November 10, 1995; Gettysburg, Pa.
Alden Francis Butler, '26; November 25, 1995; Harwich, Mass.
William Alexander Forrester, '26; September 14, 1995; Manchester, Vt.
Walter Eder Lobo, '26; November 10, 1995; New Canaan, Conn.
Smith Davison Turner, Jr., '26, SM '29; August 23, 1995; Staten Island, N.Y.
Carlton Griffith Davies, '27; November 1, 1995; Charleston, S.C.
Lee McCanne, '27; June 27, 1995; Old Lyme, Conn.
Chih-Kung Jen, '28; November 19, 1995; Silver Spring, Md.
John Eugene Dube, '29; October 1, 1995; Somerville, Mass.
Walter Francis Mattlage, '28; October 3, 1995; Boca Raton, Fla.
Abraham G. Stone, '28; March 15, 1995; Bethesda, Md.

Richard Grant Foster, '30; August 29, 1994; Chatham, Mass.
John Augustus Roos, SM '30; October 28, 1995; Erie, Pa.
Allan Hanson Stone, '30; September 15, 1994; Elkhart Lake, Wis.
Charles Hoffman Gilmour, '31; September 28, 1995; Charleston, W. Va.
George Burnham Hoadley, SM '32, ScD '37; September 10, 1995; Raleigh, N.C.
William Adams Kirkpatrick, '32; March 20, 1995; Kalamazoo, Mich.
Hawthorne Nevin Brown, '36; June 6, 1994; Hull, Mass.
Luis Victor Emilio, '36; September 5, 1995; San Leandro, Calif.
Joseph Hedge King, '36; November 15, 1994
James Fergus Patterson, '36; October 12, 1995; Pleasantville, N.Y.
William Arthur Reilly, '36; October 23, 1995; Dover, Mass.
Walter Gottlieb Seinsheimer, '36; June 6, 1995; Cincinnati, Ohio
Austin Carr Loomis, '37; February 25, 1995; Tolland, Mass.
Norman Loring Davis, '40; August 22, 1995; East Falmouth, Mass.
James Buchanan Rea, '40, ScD '47; September 21, 1995; Los Angeles, Calif.
Charles Bivens Britt, '41; February 4, 1993; Fairfax, Va.
Richard Dittrich Schmidtman, SM '41; November 6, 1995; Seattle, Wash.
Loren Lester Dickerson, ScD '42; August 20, 1995; Huntsville, Ala.
Raymond Rutterford Richards, '43; February 21, 1995; Milton, Mass.

Andrew Raymond Buccini, '44, '47; April 2, 1995; Richmond, Va.
Elbert Foster Harris, '45; September 1, 1995; Bryan, Tex.
Carolyn D. Robbins, '45; July 8, 1995; North Aurora, Ill.
James Govan Moir, '47; March 12, 1971; Troy, N.Y.
Mitchell Silverstein, '48; August 26, 1995; Naples, Fla.
Backman Wong, '48; September 30, 1995; Wayland, Mass.
Kenneth Johnson Cole, '49; September 23, 1995; South Wellfleet, Mass.
Joseph Michael Lynch, '49; October 15, 1995; Santa Monica, Calif.
Parker Painter, '49; June 19, 1993; Ocala, Fla.
Philip Stevens Dumka, '50; August 4, 1995; Carlisle, Mass.
Daniel Paul Lundgren, '50; November 13, 1995; Madison, Ala.
Francis James Shannahan, '50; January 6, 1995; Medford Lakes, N.J.
Genille Cave-Browne Cave, PhD '51; November 10, 1995; Montreal, Canada
Isaac Van der Hoven, SM '52; July 18, 1995
Bernard Margolis, PhD '52; June 27, 1995
Paul James Chestna, '55; August 24, 1995; Shrewsbury, Mass.
Albert Benjamin Suttle, SM '55; July 31, 1995; Boone, N.C.
William S. Baldwin, '63; October 26, 1995; Cape Coral, Fla.
Francis Clyde Rauch, PhD '65; June 11, 1995; Warrington, Pa.
Steven Grant Marshall, '67, SM '70; November 21, 1994; Belle Mead, N.J.



HERE MIGHT
A NAME BEST LIVE?



The name of a deceased MIT alumna or alumnus can be linked to the Institute through gifts made by classmates, colleagues and family. Memorial gifts can be unrestricted or directed toward scholarships, research or any program of the Institute. The Institute notifies bereaved families of the name of each donor, and each gift becomes a part of MIT's permanent record.

Named endowed funds whose income supports the work of the Institute in perpetuity can be established with larger gifts. If you would like information on ways of expressing sympathy through a memorial contribution, or on establishing a named endowment fund, please contact Betsy Millard, MIT Room E38-202, Cambridge, MA 02139 or call (617) 253-8059.

PuzzleCorner

It has been a year since I specified the size of the backlogs for the various kinds of problems that are printed.

Currently, I have a multi-year supply of regular problems, and over a year of speed problems. Bridge problems, however, are in short supply. Chess, go, and computer problems are now considered regular problems.

Problems

Apr 1. We start with a bridge problem from Doug Van Patter.

North
 ♠ K J 10 4
 ♥ K Q 6 5 2
 ♦ A Q 8
 ♣ 4

South
 ♠ A Q 9 3
 ♥ 7 4
 ♦ 7
 ♣ A K Q 9 7 6

South dealt and the bidding went as follows with East-West silent: 1♣ 1♠ 4NT 5♦ 6♠. What is South's best line of play?

Apr 2. Ermanno Signorelli wonders if there is a right triangle with integer sides such that both legs are odd integers.

Apr 3. An illuminating question from Chuck Livingston:

Lamp posts are to be installed on the equator of a perfectly spherical planet in such a way that they illuminate the entire equator. A few very tall lamps could be used—three is the minimum—or many short lamps. In what way should this be done so that the total height of the posts is as small as possible?

Speed Department

Each item below contains the initials of words that will make it cor-



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB
 NEW YORK UNIVERSITY
 715 BROADWAY, 10TH FLOOR
 NEW YORK, N.Y. 10012,
 OR TO: GOTTLIEB@NYU.EDU

rect. Ron Bianchini wants you to complete the missing words. For example, 16 = O. in a P. would be "Ounces in a Pound."

90 = D. in a R. A.
 200 = D. for P. G. in M.
 8 = S. on a S. S.
 3 = B. M. (S. H. T. R.)
 4 = Q. in a G.

Solutions

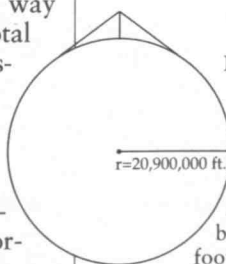
N/D 1. Here is an offering from Joesph Keilin, who writes: On their way home from an evening of bridge, a couple was commiserating with each other. "Can you imagine that? We had 39 high card points between the two of us, I played perfectly, and still we went down one at 3 no trump. And it wouldn't have made a difference if you had been declarer." said one. "The opponents played perfectly, also. Besides, it would have been even worse in any suit contract, again regardless of who was declarer," said the other. What was the hand that all four players held?

The key, as you might well guess, is to inhibit communication between the declarer and dummy. Warren Himmelberger sent us the following solution diagram with the remark that if North leads a spade or South leads a club, a game is not possible in any suit or no trump.

North
 ♠ J 10 9 8 7 6
 ♥ 10 9 8 7 6 5 4
 ♦
 ♣

West East
 ♠ A K Q 5 4 3 ♠ 2
 ♥ A K Q J 3 2 ♥
 ♦ ♦ A K Q J 3 2
 ♣ A ♣ K Q J 4 3 2

South
 ♠
 ♥
 ♦ 10 9 8 7 6 5 4
 ♣ 10 9 8 7 6 5

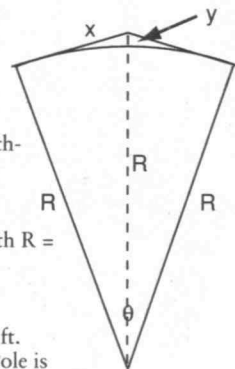


N/D 2. Perhaps Richard Hess is considering some flagpole sitting in cold climates. He writes: Imagine a rubber band stretched around the world and over the North Pole as shown at right. Given that the rubber band has had to stretch an extra foot to accommodate the North Pole, how high is the North Pole? Steve Feldman sent us the following solution:

I started with:
 $2\pi R + 1 = ((2\pi - \theta)/2)\pi R + 2x$
 which yields:
 $x = (1 + R\theta)/2$

I then looked at the right triangle which requires that:
 $\tan(\theta/2) = x/R$
 Putting these two together, I got:

$(1 + R\theta)/2 = R \tan(\theta/2)$
 which yields (through numerical solution, with $R = 20,900,000$ ft.):
 $\theta = .008312046$
 $x = 86861.38$ ft.
 $y = \sqrt{(x^2 + R^2)} - R = 180.5$ ft.
 Therefore, the North Pole is 180.5 feet high.



John Prussing notes that interestingly, if one numerically determines an "exact" zero of the equation without approximating the tangent function, one obtains $h = 102.13$ ft. in a standard single-precision computation. Only by using double-precision arithmetic does one obtain $h = 180.47$ ft., the same result as the (single or double precision) solution obtained by approximating the tangent function by the first two terms of its Taylor series. The approximate solution is more accurate than the "exact" single-precision solution.

N/D 3. Warren Himmelberger just loves to have 8 numbers add up to 260.

Write the numbers from 1 to 64 in the checker board square so that all columns and rows add up to 260, and also that the following groups of squares add up to 260:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| + | o | + | + | + | + | + | + |
| o | + | + | + | + | + | + | o |
| + | + | + | + | + | + | + | + |
| + | + | + | + | + | + | + | + |
| + | + | + | + | + | + | + | + |
| + | + | + | + | + | + | + | + |
| + | + | + | + | + | + | + | + |
| + | + | + | + | + | + | + | + |

Only the proposer solved this problem. Along with the checkerboard of numbers printed below, he included the comment that "The solution is derived from combinations of 65 in two vertical halves. Amazing!" Amazing indeed.


- Any of the 70 arrangements of 2 by 4 squares.
- The sum of the 4 middle squares and 4 corner squares.
- The sum of any two adjacent half-diagonals (indicated by - - -).
- The sum of the interior half-diagonals (indicated by □).
- The sum of the top 3-square diagonals and the 2 corner squares enclosed (indicated by +), and the sum of the bottom 3-square diagonals and the 2 corner squares enclosed (indicated by -).
- The sum of the 4 2-square diagonals (indicated by o).
- The sum of the pairs of squares adjacent to the 4 middle squares (indicated by *).
- The sum of the pairs of squares midway between the edge squares and those pairs adjacent to the 4 middle squares (the 8 blank squares).

Continued on Page MIT 40

MIT LIFE INCOME FUNDS

MR. AND MRS. RICHARD M. ADLER

HOME: New Orleans, Louisiana



CAREER: Graduating from MIT in 1946 with a degree in naval architecture and marine engineering, Richard Adler has spent his entire career building ships. After serving in the Navy at the David W. Taylor Naval Ship Research and Development Center in Maryland for one-and-a-half years, he took a position at the Ingalls Shipbuilding Corporation in Alabama. He began working for Equitable Equipment Company, a New Orleans company that built oil-field vessels and tugs in the early 1950s. Recalled to the Navy during the Korean War, he subsequently returned to Equitable, and rose to the position of vice president of engineering. In 1974, he joined Avondale Shipyards, and in 1987 became an independent engineering consultant in the shipbuilding industry.

Barbara Adler earned a bachelor's degree in education from University of Southern Alabama and a graduate degree from Tulane University. She is the director of the Lower School Learning Center at the Isidore Newman School in New Orleans. Together they have four children,

three from Mr. Adler's previous marriage and one from Mrs. Adler's.

MIT LIFE INCOME FUND: Richard M. Adler Charitable Remainder Unitrust.

QUOTE: "MIT's Life Income Funds allowed me to reach several important goals. One was to make a substantial contribution to MIT, which I regard as a national treasure. Then, by donating long held, low cost securities, I was able to make the gift without detriment to both Barbara's and my lifetime incomes. And, the scholarship fund that will flow from the unitrust will honor the memory of my parents, Julian (13, CH) and Hermione Adler, and carry on their tradition of generosity to MIT."

For more information about MIT Life Income Funds, write or call D. Hugh Darden, W. Kevin Larkin or Frank H. McGrory at MIT, Room 4-234, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139-4307; (617) 253-3827.

Photo: Mike Posey

TECHNOLOGY UPDATE

900 MHz breakthrough!

New technology launches wireless speaker revolution...

Recoton develops breakthrough technology which transmits stereo sound through walls, ceilings and floors up to 150 feet.

by Charles Anton

If you had to name just one new product "the most innovative of the year," what would you choose? Well, at the recent *International Consumer Electronics Show*, critics gave Recoton's new wireless stereo speaker system the *Design and Engineering Award* for being the "most innovative and outstanding new product."

Recoton was able to introduce this whole new generation of powerful wireless speakers due to the advent of 900 MHz technology. This newly approved breakthrough enables Recoton's wireless speakers to rival the sound of expensive wired speakers.

Recently approved technology. In June of 1989, the *Federal Communications Commission* allocated a band of radio frequencies stretching from 902 to 928 MHz for wireless, in-home product applications. Recoton, one

of the world's leading wireless speaker manufacturers, took advantage of the FCC ruling by creating and introducing a new speaker system that utilizes the recently approved frequency band to transmit clearer, stronger stereo signals throughout your home.

150 foot range through walls!

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Recoton's transmitter sends music through walls to wireless speakers over a 70,000 square foot area.

Crystal-clear sound anywhere.

Just imagine listening to your stereo, TV, VCR or CD player in any room of your home—without running miles of speaker wire. Plus, you'll never have to worry about range because the new 900 MHz technology allows stereo signals to travel distances of up to 150 feet through walls, ceilings and floors without losing sound quality.

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The speaker, mounted in a bookshelf-sized acoustically constructed cabinet, provides a two-way bass reflex design for individual bass boost control. Full dynamic range is achieved by the use of a 2" tweeter and 4" woofer. Plus, automatic digital lock-in tuning guarantees optimum reception and eliminates drift. The new

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Stereo or hi-fi, you decide. These speakers have the option of either stereo or hi-fi sound. Use two speakers (one set on right channel and the other on left) for full stereo separation. Or, if you just want to add an extra speaker to a room, set it on mono and listen to both channels on one speaker. Mono combines both left and right channels for hi-fi sound. This option lets you put a pair of speakers in the den and get full stereo separation or put one speaker in the kitchen for hi-fi sound.

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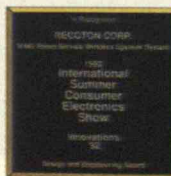
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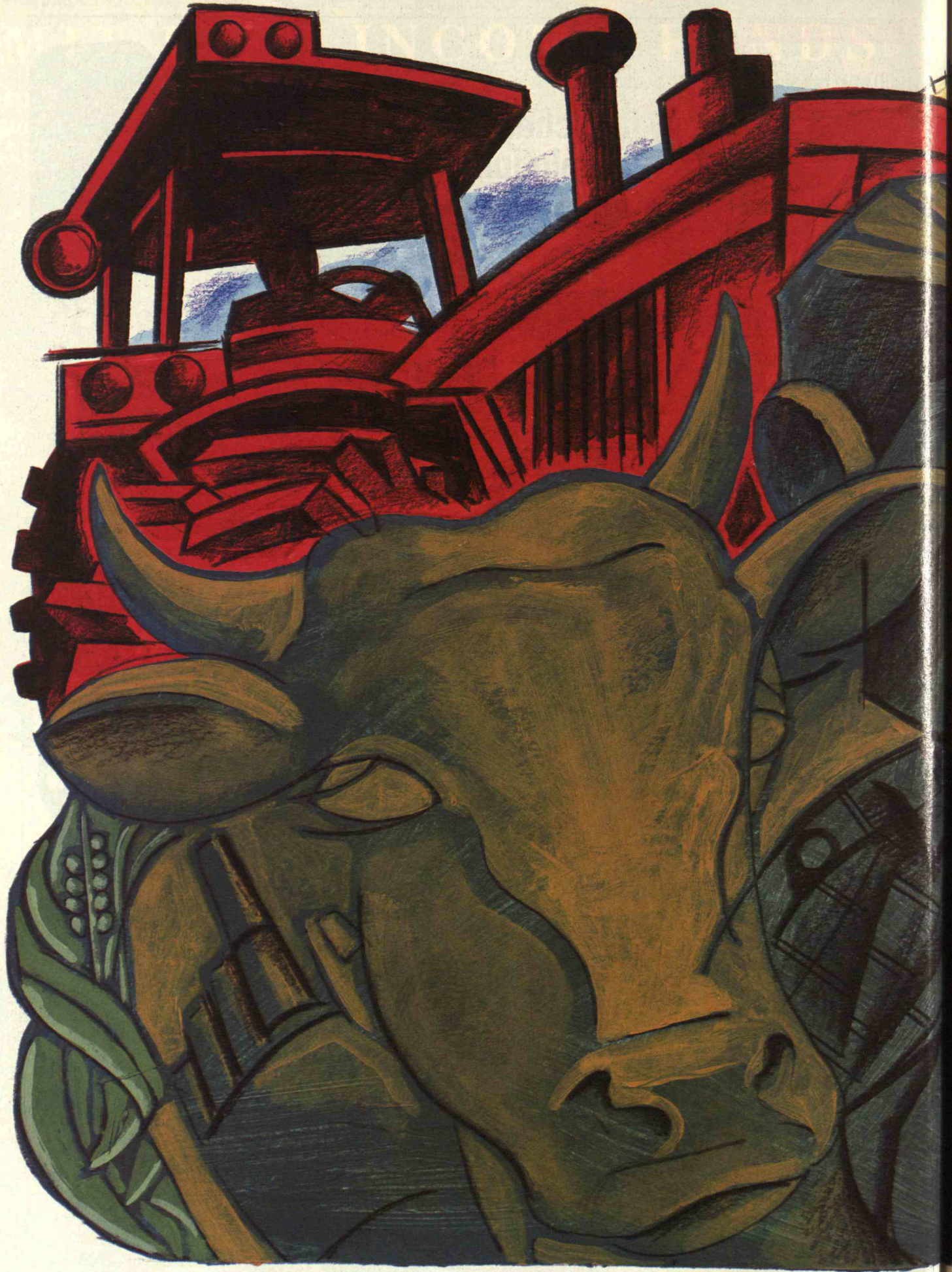
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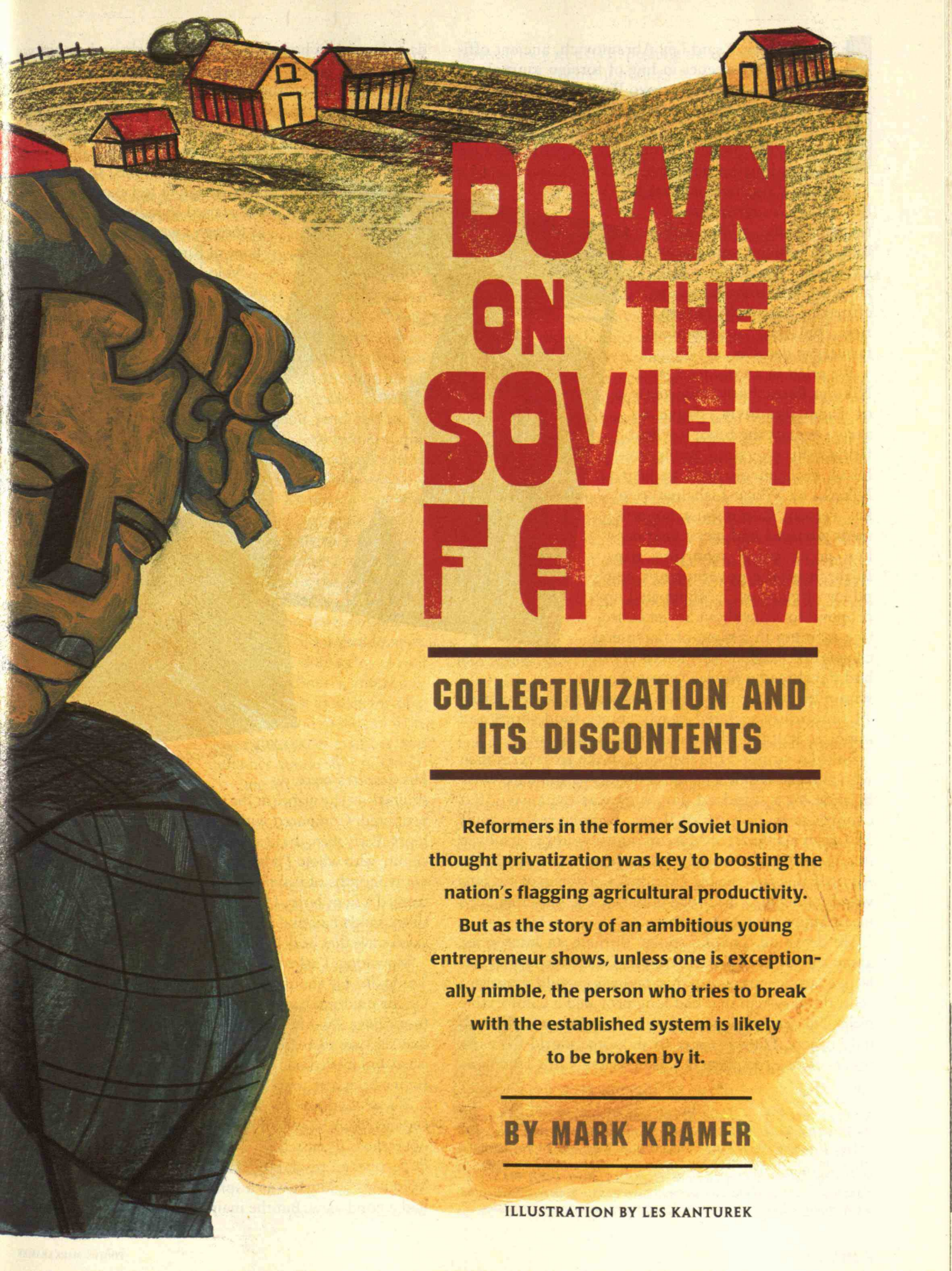


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DOWN ON THE SOVIET FARM

COLLECTIVIZATION AND ITS DISCONTENTS

Reformers in the former Soviet Union thought privatization was key to boosting the nation's flagging agricultural productivity.

But as the story of an ambitious young entrepreneur shows, unless one is exceptionally nimble, the person who tries to break with the established system is likely to be broken by it.

BY MARK KRAMER

ILLUSTRATION BY LES KANTUREK

ASSURE you," said Lev Abramovich, ancient official greeter, keeper-in-line of foreign journalists, and apologist for Ivanovo Region agriculture, "I travel around, and the barn you are about to see at Collective Farm Trudovik is the worst in the area." My official Communist keeper for this leg of my journey across the Soviet Union in 1989 didn't approve of what his bosses at *Gosagroprom*—the monolithic, all-controlling, late-Soviet superministry of agriculture—had assigned him to show me: the efforts of one of the nation's first halfway independent farmers in decades.

We piled in an old jeep, and Nikolai Petrachkov, chairman of Farm Trudovik, drove us across one of the bumpy wheat fields in his oversized dominion. I had been encouraged to visit Nikolai by Viktor Lishchenko, a key reform Communist government adviser I had met a year earlier on a prior reporting trip. Inspired by the government's new policy of *glasnost*, he supported my proposal to write about Soviet collective farming in a time of presumed change and examine why a nation that had developed a nuclear arsenal and whose farms stretched from Norway to Korea across 11 time zones suffered nearly empty food shops and imported half the wheat in every loaf of bread.

Nikolai stopped the jeep and spoke to several men who lounged beside a halted combine—a standard work brigade on a standard day. This was expansive, flat country, near the town of Shuya, Ivanovo region, some 200 miles northeast of Moscow, and a world apart. Even in midsummer the air felt thin, a breeze away from the Arctic. Far across the big grain fields, a ribbon of low pine woods underlined the broad gray sky. The vista reminded me of Maine's potato counties.

We drove on. Nikolai spoke, through an interpreter, about the future of Soviet farming. Unlike the typical collective farm chairman (to this day) who would preserve a centralized system that had long provided a comfortable niche, Nikolai envisioned far greater autonomy for individual farmers. He was eager to show the world the early results of his experiment in leasing one of Farm Trudovik's

dairy barns to a brigade headed by a bright and ambitious young worker named Volodya Kurikhin.

We pulled up in front of Volodya's tumbledown cattle shed. In fact, we'd passed many barns in worse condition on the 45-minute drive out to Shuya. Lev was not above spin control. "The barn sags," he said. It did, but the roof looked sound. I was naive enough to feel excited. Nikolai had praised Volodya so highly I felt as though I were about to meet the hope of Russia.

Volodya wasn't prepossessing, which was proper for a savior.



Volodya Kurikhin



Nikolai Petrachkov

His gestures were restrained—a shy glance at the visitor, a hand barely proffered. Compared with the charismatic and routinely hearty Party men, the ideological guardians of collective agriculture with whom I'd had to keep regular company during many months of travel across the Soviet Union, Volodya seemed a faint hope. He stood just under six feet tall, with short, sandy hair and a completely cockeyed grin—a right-sided smile that he delivered with head listing to port.

How long, I asked, had he been a member of the Farm Trudovik? He shook the listing head. "I'm not a member. On my residence papers, I am still registered as an electrician from Shuya. I worked on many new barns, including the one that sits over there," he pointed at another building. "I finished and moved on to other farm wiring jobs. But in May I came back here to milk cows."

We strolled across his barnyard and at my suggestion clambered up 10 tiers of hay bales to the tin roof of the big, open shed. It was clean and quiet. I arranged a bale as a desk, opened my laptop, and wrote looking out across Volodya's fields. It was a splendid, sunny afternoon. We had a good view. But the main reason Volodya and I and

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an interpreter had climbed the hay mow was to get clear of Lev, who, in his seventies, didn't climb bales. He hung out down below, though, where he might overhear the conversation. We spoke quietly.

"I spent five years as an independent builder," Volodya said. "I hated working eight to five, with a time card. I'm like a cossack—independent." He was in the small first wave who'd decided to answer Gorbachev's ambiguous call for some independent farmers, he said. "I didn't know much about how to farm. Television shows some Western farms for a minute now and then. I've picked up a little from that.

"The problem," Volodya said, "is that everything—even the cows—still belongs completely to the collective farm. The farm can take them back and controls all decisions about them. We can't cull out a single bad cow and send her to be slaughtered without the approval of the collective-farm zootechnician. We have a cow as big as a railroad car who gives hardly any milk. She just eats. If I had my way, I'd sell her for meat and buy a calf of good breeding with the money. We wrestled back and forth for months before the zootechnician let us get rid of 10 terrible cows. There are 10 more we would sell if we could. But the zootechnician here is just looking for a big cow population so she can write down the census number and fulfill her quota; she's not looking for quality.

"I also lack high-protein cow feed. That would make my cows give more milk. But the chief economist doesn't care about growing quality feed; she's just got crop quotas to count. After just a few months,

I have proved that a higher yield is possible. In this old barn, we're already producing more milk than the regular dairy brigades provide here on Farm Trudovik. But it will take us three years to make a good

herd—if they let us. I'm pushing the collective farm to double my land. With our number of cows, the norm is about 250 acres, and we don't even have half that.

"I need the chance to grow my own feed. I want to grow other types of grain than what they grow here—and have several fields in a rotation. I want to grow turnips, and perennial grass, and vetch. If I grew oats, which are in short supply, I could sell them and maybe use the money to buy other feed.

"There also isn't enough technical information for a small operator like me. We need foreign sources on that. We have lots of Russian handbooks about how to farm, but still the situation doesn't improve. It deteriorates."

In the midst of Ivanovo region's agricultural mayhem, Volodya Kurikhin burned with a fervent ambition unusual in the USSR. He was near to winning the rarest privilege in the nation: a chance to do a complex job very well. We climbed down from the haymow, and there was Lev right below us, hustling away lest we imagined he'd been trying to listen in.

Volodya had organized a tiny office for himself inside his rundown barn. Cows lowed and munched cud outside the doorway. He'd slept there the night before—a greasy old quilt and crumpled newspapers spotted with food lay on a cot. Farm records were strewn on a board table. He was attentive to his job. I told him he was the first ambitious guy I'd met in weeks. He smiled grimly and said, "Some of my crew feel as I do, although one or two think this work is just a job, same as everywhere else."

His next line could have been scripted for a U.S. Information Agency propaganda film: "But even if someone is interested only in money, he'll still work hard for us. Because he knows that if he does, he'll get much more money. Because I even sleep here at night next to the cows, I'm in a good position to say to others on the crew, 'See here, I work hard and so should you.' " Volodya sounded like a manager.

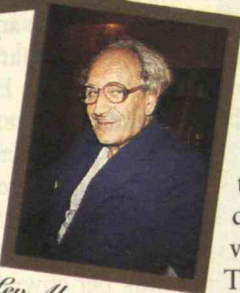
He also sounded weary. His neighbors on the farm, working for their usual uninspiring wages, had seen Volodya's enterprise as a private giveaway of state property—their property. "Nikolai Petrachkov, the chairman of Farm Trudovik, has provided us with good land, a tractor, other equipment," Volodya said. "At the beginning I felt he was the only one who supported us here. Now I feel the situation is becoming more normal. Other people in the community who were envious are getting used to us. Their tempers have subsided. They are paying less attention. But I'm still doubtful that politics will change in the whole country, or even here on the farm."

Hoping to protect their novel arrangement against such politics, Nikolai and Volodya drew up a contract for the use of this barn, a kind of folk-lawyerly attempt to set down the rights and duties of both lessor and lessee, and they filed it in the office of the quota-conscious farm economist. The contract essentially created a mutually imposed zone of law in a nation with little business law. Contracts with workers were rare and, when they existed, more often amounted to no more than a sentence or two

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Barn at Farm Trudovik



Lev Abramovich

asserting that workers would work and be paid.

This mongrel, home-made, topsy-turvy manifestation of both sides' wish for law was Nikolai's attempt to back himself, to render more legitimate and safer his authorization of an ideologically iffy and locally unpopular enterprise. He'd courageously gone ahead and supported Volodya in a time of new *perestroika* possibilities and continuing uncertainty. And he had done this in a place where private effort for private gain was considered selfish and immoral. Such doctrine was drummed into children all through school.

The contract, redolent of the time and place, was typed sloppily on a half-dozen sheets of yellowing paper. It specified assorted obligations of the lessee, Volodya, which included paying the rent, producing a quota of milk, inseminating and caring for the cows, maintaining the equipment, and removing dung. The duties of the lessor, Nikolai, included buying the milk and providing the barn, barn repair, land, well, milking equipment, and veterinary service.

Dated 10 May 1989, the contract would be valid for five years. Although it stated that "after every year, the treaty should be looked into again and some changes can be made," it stipulated that both sides must agree to any changes. It also provided that "if we have a disagreement over the execution of the agreement, we can bring it to the attention of the Shuya Court."

Volodya is a good farmer now," Nikolai Petrachkov said. We sat at the supper table with his wife, Taisa Stepanovna, who was chief economist at Farm Gorky, the next farm down the road. We worked through a new delivery of special-guest food that had been delivered by Party officials that afternoon for the comfort of the American Delegation (me). "He was not one when he started. After helping me wire a new dairy barn, he proposed a small farm, in line with Gorbachev's suggestion that we establish lease brigades. After many meetings, I felt he was serious, so we worked out the contract you saw. We gave him and his crew the old, abandoned barn. Our zootechnician selected 60 animals—frankly, they were the worst on the farm. But that's what she gave them.

"This summer," said Nikolai, "Volodya and his brigade are working 107 acres with two tractors we also gave—no, rented is the word. They pay rent to Farm Trudovik. The farm economist knew how to figure out the rent for the tractors and barn. This is not completely new. As for renting land, that is confusing. In the end, the lease-brigade members earn about twice what others at Trudovik earn, but work longer, harder hours. They produce more.

"We buy all their milk, for an average of 35 kopeks a



Farm economist Liubova B. Zotina (left) and chief zootechnician Nadezhda A. Shashkova

liter. The state pays us 38 kopeks for each liter we deliver. We get another subsidy that makes our total 54 kopeks, so we actually profit almost a ruble for every 5 liters we buy from Volodya and sell to the state plant. And we have fewer headaches than before. They perform so well, we seldom hear from or see them. They take care of growing and finding their own feed. They've already improved the building, which was poor.

They've got the tractors running. They have almost never shown up at my office with unexpected problems.

"On our books, we still pay out exactly the salary that we did before for maintenance of those 60 cows," Nikolai said. "But we pay 6 people instead of 12. And I have to say, that makes some of the people in our town angry at them, and at me. 'Look,' the people say, 'the land belongs to the collective farm. The cattle also belong to the farm. So why do you allow those people to make a killing out of our common property? They don't share their money with everybody. How can you allow that?' But not everybody complains, and it's not hard for me to handle. This experiment should be here."

Taisa Stepanovna was more direct. "The complaints come from loafers, too lazy to work hard," she said. "They're a kind of union of sluggards, young and old, men and women, paid all their lives for the literal execution of their orders, without a care in the world about quality."

"It bothers people who earn half as much," said Nikolai, "and don't see Volodya in the barn 14 hours a day, then sleeping right there, getting up during the night to tend new calves. Envy has no logic. These others could work harder and earn more, too. But Volodya and his crew are the only ones who have asked for a lease brigade. I hope more people will see that this way is good for our farm and country. In fact, there are huge sections of abandoned land that should be given to small farmers. But as long as we don't have basic laws on land or property, I am not even sure that what I have done is legal."

After breakfast, in the middle of my week's visit, I sat in Nikolai's office at Farm Trudovik. Nikolai read mail, responded to questions from crew chiefs and aides who ran in and out, and planned out his day of keeping the harvest going and construction projects working. Eventually he found time to chat. "Volodya's farm has been in operation just three months," he said. "Let's review its production numbers." He picked up the phone and gave a few commands.

The farm economist strode in. Liubova B. Zotina sat with a straight back and spoke with clipped, precise speech: "To date on the special unit, milk per cow: consistently 12 percent overfulfillment of their plan. In May, June, and July, projected average yield per cow was 325 liters. Actual aver-

age was 364 liters.” What she did not say—although Nikolai looked up the numbers later—was that Volodya’s group also outstripped Farm Trudovik’s production. In May, June, and July, Trudovik cows averaged 284 liters of milk. Given the worst cows and the worst building, Volodya’s crew started out doing 28 percent better than the collective work brigades. Increases in yield on dairy farms are hard won. The numbers were impressive.

Nikolai called in the chief zootechnician, Nadezhda A. Shashkova. She sat, ankles crossed and face stern, and reluctantly recited her digest of Volodya-related facts: “He’s got basically the same quality herd that we have on the rest of the farm. On my authority we have sent for butchering 10 of 60 cows, and I am looking at eliminating another 6. Our average cow lasts six or seven years. By regulation, we may cull only barren cows or those with atrophy of the udder. Otherwise, we are required by law to keep every one and push milk production even in less-productive animals.” This amazing regulation made no sense for any farm wanting to maximize milk production. American cows last about four years in herds. Such turnover is a part of high production.

So I asked the zootechnician a question she may have found bold, or even rude: how did she feel about doing her job less well than she knew how, in order to make the record look good? Surprisingly, she smiled. “I feel frustrated and terrible after many years of work in our agriculture. We’ve always had to follow certain procedures contrary to science and common sense. In the past few years, under Gorbachev, we’ve started to breathe a little more freely.”

I asked if she was surprised that Volodya had gotten good results so quickly. But Nikolai, a kind man, saved her additional embarrassment by speaking up: “I hope it’s the first bird of summer. I can’t encourage others yet, with no law to back me up. When there is, I’ll start more lease brigades. We can’t raise productivity following the old path. Lease brigades seem like the surest available way toward change. Look at those statistics: In labor productivity, these city boys already do as well as our most experienced milkmaids! They even harvested and stacked their own hay, I see, which somehow isn’t part of their productivity data—and which milkmaids don’t do.”

“I’ll add hay activity,” the economist said glumly. She saw

me studying her and offered a slight, strained grimace. The farm zootechnician’s face mirrored the expression. The two were disapproving underlings. They didn’t like Nikolai Petrachkov’s sponsorship of Volodya, and were clearly edgy in this candid discussion.

Their overt opposition impressed and puzzled me. I later came to understand that their attitudes were the norm. Nikolai was the adventurer. His outspoken support of the idea of efficiency, of more pay for more work, of maximizing asset management, jeopardized the communal sense of equality and stimulated resentment of Volodya’s private advantage. As little as communal equality represented the actualities of Soviet life, it was operant patriotic myth.

The sourness of the economist and zootechnician was in the air every time I ran across them during my week on Farm Trudovik. I was glad to leave, and during my first few days back in America, I found myself, with the fervor of a Jay Cee, drinking in every glimpse of good work well rewarded.

**Just three months
after being given
the worst cows and
the worst building,
Volodya’s lease
brigade was 28
percent more pro-
ductive than the
collective crews at
Farm Trudovik.**



Aleksander Sorokin

The next summer, I was back in the USSR and had a few days for a hurried trip to Ivanovo. I wanted to see what a year and a half on the job had brought to Volodya’s lease brigade. I took the train to Ivanovo with an interpreter named Yelena, a graduate student suggested by Viktor Lishchenko, the senior adviser on agriculture to the reform Communist government who had helped plan some of my Soviet travels.

We got off the train and went to see Aleksander Sorokin, the regional head of agriculture with whom I’d drunk vodka and had a heartfelt chat one evening during my previous visit. “How’s Volodya?” I asked. Sorokin answered, “I’ve heard he’s got family troubles. His wife—I heard his wife complained about his farming.”

“But I have an interview on tape,” I said. “He says how proud she is and that she approves of his hard work.”

“Well, ask Nikolai Petrachkov,” said Sorokin, shrugging, dismissing Volodya and bringing up instead a blue fox farm that was a personal fascination.

Yelena and I drove the 45 minutes out to Shuya. At high noon at a restaurant in town Nikolai greeted me like an old friend, clapping me on the back, grinning; I’d rarely felt so warmly welcomed anywhere. As on our first meeting, he looked like a country and western star. His pompadour yet waved, with no gray in it. At lunch, Nikolai and I discussed

America, not business. Then we jounced out of town in his jeep—but not to Farm Trudovik.

Instead we went to a ground-floor office in a cement administration building on Farm Gorky, the next farm down the road, where Nikolai's wife worked. Over the winter, the prior chairman had retired, and Nikolai had been invited to leave his previous post and join his wife in running it. I began to suspect what had happened to poor Volodya.

We sat at the long table that nearly filled Nikolai's new, smaller office. A portrait of Lenin hung on the wall behind him. Nikolai, reluctantly at first, filled in events. Aleksander Sorokin had offered him the job: "Sorokin said it would be difficult for an outsider to take on."

Taisa came in and out, half listening, working at her own projects. "I considered staying on at Farm Trudovik," Nikolai said, "to finish the projects I'd started. But I couldn't resist the new job." Not only had he grown up on Gorky, but it was larger, more fertile, and richer, and he liked having his wife guarding his back as farm economist, in place of the oppositional staff at Trudovik. "I lacked complete harmony there," was his polite understatement. "But the return to my home farm brought one painful regret—the move let loose troubles that brought Volodya Kurikhin's farm down."

Volodya had needed Nikolai's protection right from the start—that was normal for a reform experiment amid the tangle of bureaucracy connecting every job. A Soviet rule: if a corner of the economy worked, it was a protected exception. Like the wealthy collective farms I'd visited whose chairmen had found patrons high in the Party, Volodya's lowly but prosperous lease brigade had worked out because it had special protection. It had started after Volodya impressed Nikolai, who'd impressed Sorokin, who'd impressed some big boss in Moscow, perhaps Viktor Lishchenko, forming a chain of personal impunity that warded off bitter functionaries and envious neighbors who hated communal resources producing private gain.

Nikolai's move over to Farm Gorky broke Volodya's chain of patronage. Farm Trudovik's new chairman was "a careerist—a conservative, normal chairman," Nikolai said, "a good chairman who knows how to farm and who was educated at a fine agricultural institute. He had previously managed another collective farm, and is younger, so he'll be able to build Farm Trudovik for years." Nikolai smiled.

Taisa, who had sat down to hear this part of the tale, stated the sad truth: "Nikolai's replacement did not believe in lease brigades." She was angry and bold. "The ladies you



Road behind Farm Trudovik

talked to with my husband in the office last year—that zootechnician, the economist—would have said the opposite of what they told you if they'd been alone. They'd have told you that Volodya's performance was mediocre, that allowing an outsider like Volodya on their land, especially to make such big money, was improper. The zootechnician had a big fight with her own husband before he himself joined that brigade.

"Nikolai couldn't throw his full support behind Volodya. He'd felt worried with no laws on property or land. Those laws still haven't come through. Nikolai felt the future of Soviet farming lay with the lease brigade—and private land, too. He had wanted to transfer Volodya to a better barn."

Nikolai spoke up: "Gorbachev recognizes that our main problem is that people can't take initiative. It is crucial. The case of Volodya demonstrated that things can change if you allow people to take initiative. I'd buy my collective farm if I had money and law permitted. It's a pity that 70 years of Soviet power haven't given the average Soviet an adequate philosophy so all collective farm members would really take responsibility." I'd often heard this sentiment expressed on my Soviet excursions, and it always made me sorrowful. I thought it an accurate lament about the default selfishness level of humankind, which capitalism plays to, but socialism exceeds.

"Now Nikolai doesn't dare create other lease brigades here" because Volodya's deal left normal work brigades seething, Taisa said. "Nikolai was frustrated that he couldn't even back Volodya strongly last year. There was enormous resistance to Volodya."

"Volodya came to me when his troubles over there were just starting," Nikolai recalled. "He asked me to let him lease an old barn on a back lot here at Gorky. We'd had problems with some workers on that farmstead, but we solved them, and I couldn't give it to him. I never imagined he would act drastically and suddenly drop farming. He'd done it so well. I told him to be patient, and things would be OK. Volodya did not stop by to see me again. I think his hopes were shattered."

We sat drinking tea, and Nikolai said abruptly, "I heard exactly what happened, and I'll tell you. The people who envied him just dismantled his farm. He earned too much. Volodya's crew always paid their lease fee precisely, in accordance with each detail of the leasing contract I showed you. They followed the agreement to the letter. But as soon as I left, the new chairman jacked up the land rent and added other fees.

"I'd promised to make further repairs on Volodya's barn at the farm's expense—it was so old, and was farm property, and he paid rent. The first thing they said to Volodya was, 'You must repair it now, at your own expense.' The new chairman piled on so many conditions that the lease brigade had to stop work and move away. It was a shame. They'd grown high-quality cow feed. They'd increased production. Well, now he's building houses in a cooperative construction brigade." Nikolai seemed caught by the waste of it all. He sat silent for a minute.

Nikolai," I said, "let's drive down the road, find the new chairman of Trudovik and that farm economist and zootechnician, and ask for their account of what happened." Nikolai looked up, surprised. He thought for a moment. Then he grinned and hustled us into the jeep.

The flat, drought-browned wheat fields between the two farms blurred by in a few minutes. We jounced up to the dooryard of Farm Trudovik's office. Nikolai held up his hand. He would not go in. He would oblige the American Delegation in that time of maximal *glasnost* and he would enjoy imagining the conversation inside, but he would not witness the second-guessing of a hack chairman who'd been ensconced by higher-ups.

I opened the door to the office. The secretary wore a cotton housedress, white with little red and yellow flowers spaced evenly on it. "American journalist here to visit with the chairman," my translator, Yelena, announced. Then I was in his office. We had stumbled in at the right instant.

The chairman was compact and gray-haired, with a pleasant enough smile. He held out his hand and introduced himself: "Drozhin—Vladimir Anatolievich Drozhin." He seemed amiable and poised enough to be cordial, even though he must have been bewildered by this surprise visit. He introduced the economist and the zootechnician, whom I recognized from the year before when they'd worked for Nikolai, and who now sat at the new chairman's side. They recognized me, too. We shook hands.

This chairman kept two likenesses of Lenin in view, a portrait and a statue. The office must have already looked like this shortly after the farm started in the 1930s. It had a linoleum floor and walls thick with drab paint. I'd interrupted a staff meeting. The chairman dismissed all but the two women. I explained to him that I'd spent a week at the farm a year earlier and hoped to catch up on events. How was his new job going?

Drozhin: "It's unrealistic to steer a course before getting to know the people. People here seek order, but a manager can't simply command these days. We must find the instruments to make people do what they want to do."

**With Nikolai's
special protection,
Volodya's lowly
lease brigade
prospered.
Without it,
the reform experi-
ment was quickly
doomed amid
a tangle of
bureaucracy.**

This was a familiar Soviet voice, that of a standard bureaucrat. I asked about lease brigades.

Drozhin: "We try turning people toward leasing so they can earn more, and so they will have to remember where money goes. Leasing evokes the interest of workers in the final results..."

I felt cranky: "Where's Volodya Kurikhin this year? I spoke with him last year."

Drozhin: "He's not here anymore. He is in the town of Shuya."

"When I was here last year, he seemed so productive and determined."

Drozhin: "It was his old barn. It was uncomfortable for the calves in the winter. We had a warm winter, so he survived, but there were not proper conditions for milking there. I suggested a new barn at another sub-farm, with 200 cows. But he didn't agree."

"You offered a similar contract? Same deal?"

Drozhin: "Probably—some differences.

They should pay for using pasture to graze cows, which they didn't do under the last contract. And the cost of land was not properly valued in their lease, so the lease was not properly valued."

"In other words, too much of the profit went to them?"

Drozhin: "Yes, almost all the profit went to them. The moral effect on the community was bad. Maybe my reason was not just economic."

The farm economist, Liubova Zotina, spoke up, offering another angle on Volodya's demise: "He left because he wanted private enterprise," she said. "He wanted to buy his own cattle, and not mix with the business of others. He can't even find a steady area of employment. He now works outside agriculture. Nobody knows where—something not very down-to-earth."

Nadezhda Shashkova, the farm zootechnician who had denied Volodya cow-culling rights, but whose own husband had joined the lease brigade, also chimed in: "My husband has returned to his place—in the collective's tractor-driver's brigade," she said. "It was impossible to live that way. Everybody envied him. There were rumors. People groused. Was I helping him to get special feed for the cows? I would not have let my husband keep working with this brigade, even if it hadn't halted."

Chairman Drozhin interrupted with his own further complaints: "They assumed no material responsibility for what they were doing. Leasing means we should get part of the profit of the tenant. We didn't get any. So we really had no payment for leasing, and if you do not have stable leasing payments, how can you have leasing at all? But you should understand that nobody drove them away. Nobody closed their farm."

The mysterious deity who opens doors for wanderers chose that moment to intervene: The chairman picked up his phone, spoke for a moment, and announced, "In a

moment, a visitor will see you." And soon, in lumbered a tall, thick blond man in his thirties with a mild smile and serious, piercing blue eyes. "Loskutov," the man growled, "Aleksander Vladimirovich Loskutov."

"He was on the brigade with Volodya," said the chairman. "He lives here, and he again works on the farm in a regular brigade. You may talk to him. Ask him anything. We have nothing to hide."

Loskutov also recalled my visit to the barn the previous summer. "What happened to your lease brigade and to Volodya right after Nikolai Petrachkov left?" I asked. There wasn't much room for subtle questions.

"We had worked all year, worked hard," he said, "and it was an agreeable way of working; the brigade was very strong. We were already discussing how to renew our deal with each other. We were about to promise to work on for at least five more years when, suddenly, at the end of the first year, the farm administrators decided on their own to revise our agreement. They insisted we raise the payment for leasing. The economist hadn't changed. She was the same person who had been consulted on the original agreement. But she changed the clauses of the agreement," he said, staring and pointing at her. Then he looked directly at the chairman. I was moved by his poise. I didn't know why, but Loskutov was speaking candidly. Maybe he was speaking guilelessly. "That was really strange. We had paid 54 rubles per hectare, times 47 hectares. According to this new arrangement, we should suddenly pay 260 rubles per hectare—five times as much."

I asked if he'd been given a chance to argue about what was fair, or to negotiate the increase. "They offered their new version—no discussion," said Loskutov. "We did not accept it. We waited a month and the brigade dissolved. We'd worked from May 1989 to May 1990, the entire first year of the agreement. Then we worked on into June. Nothing improved. We closed."

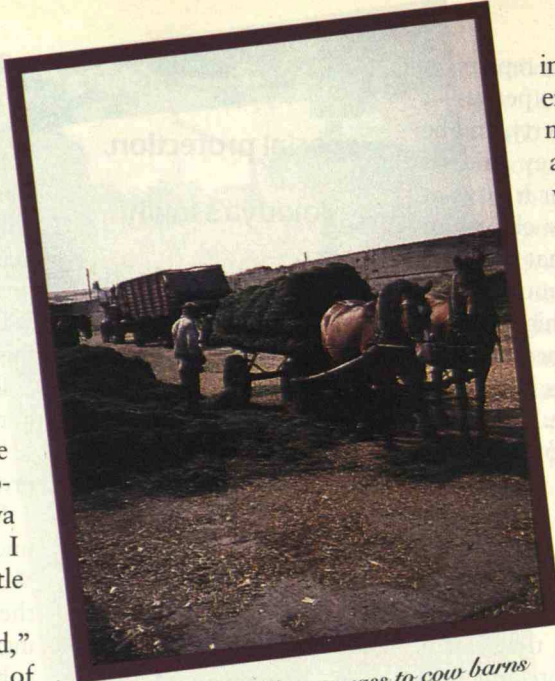
Had he felt a lot of envy and anger from the rest of the farm?

"Closing us down did quiet all the people," he said.

I asked if, before talk of closing came up, way back when they'd been working only six or eight months, others on the farm had wished to start similar lease brigades.

The zootechnician interrupted: "Interest in this kind of thing has been decreasing all over the country."

Chairman Drozhin spoke up: "A clause in the agreement said it could be revised each year and that it should be 'accepted by both sides.' But my analysis is that pushing this



Horses haul freshly cut grass to cow barns



Farm Tudovik's bottling plant

innovative lease-brigade form of enterprise on the collective farm made ordinary people fight it. In all enterprises I've encountered where lease brigades were introduced, we've experienced the fact that it's not proper. For some reason, participants think leasing and earning higher wages should be linked. But why? Leasing should not be a way of raising wages, but a way of raising the effectiveness of the enterprise! Some people don't want to work more effectively, just to earn more money." He seemed sincerely to see no connection between wage and ambition.

"Was that the case with Volodya?" I asked.

"No, it wasn't the case with Volodya," Drozhin said. "With him, the trouble was simply that other people on this farm were paid less, and I think that accounting was improper. No more questions about that..."

Nikolai awaited us outside. The whole conversation hadn't taken more than 20 minutes. Loskutov followed us to the jeep. He said he knew where Volodya lived down in Shuya and he would guide us there. We all tumbled in and excitedly took turns

describing the conversation to Nikolai as we sped away.

"That economist!" Loskutov bellowed. "She whispered in the chairman's ear, told him to change the contract on us. Damn! We were doing so well, even with the worst cows—and we were still going up. Why did they stop us? He told you how they suggested we go to another barn with more cows? He didn't tell you it was to join a big regular work brigade, and we wouldn't have had any control over who did things. We'd just be workers there. He told you our barn was unhealthy? Our cows were healthy. They told us all that nonsense, and finally, we lost our enthusiasm. Not just us. There were other people on the farm who were thinking of doing the same thing—their enthusiasm got smashed, too."

Nikolai was soon laughing. "Is this how American journalists do their work? I like it. It does not happen here yet." Still, Nikolai remained a Party defender. "A leader like Gorbachev can introduce a new system. But if the farm managers won't accept it, it won't work. Managers have to support a

leasing system and take steps that lead further on.” Nikolai sounded pensive, but he was a deeply optimistic man. “You know,” he said, smiling, perhaps at himself, “we could make our collective farm a corporation with shareholders. We may not be prepared to give over land to private ownership, but shares could be a step. A shareholder who became a pensioner could get income from prior work. A worker who moved away would have to sell back shares.”

This was, in fact, what would happen to most collective farms two years later, after the Party fell. But the new system would leave the same personnel in charge, and they would still have the same problems with individual incentive and responsibility. Nikolai and I pledged that we would meet in another few years for the next chapter of the saga as we drove off to Shuya in search of Volodya. We had an hour to spare before my train left for Moscow.

Piloted by Loskutov, we drove into the back streets of Shuya, past factories and warehouses and anonymous blocks of flats. Opposite the police station, we turned into a pitted dirt parking lot. Loskutov disappeared inside a drab apartment building. The sun had set. Heavy clouds edged with pink hung in the sky. Rain splattered for a few seconds. Grandmothers gabbed and tiny children still played around the building. I stood watching. Volodya’s neighbors stared back.

Loskutov dashed out. He’d found Volodya’s wife, Olga. A neighbor would mind their two sons. She would come right down. She might be able to find Volodya. Olga ran toward us, breathless. She’d obviously just thrown on a sweater and dabbed spots of rouge on her cheeks. She was small and shy and seemed work-weary but eager. “Volodya spoke about your visit last year,” Olga said. “He might be at his construction brigade’s workshop—it’s just a few blocks away.” She crowded into the jeep, and we twisted through Shuya’s back streets. We stopped before a ramshackle garage and Olga ran in. She came out shaking her head. “His truck headed up to Palekh a few minutes ago. He will be sorry.”

“So are we,” I said. “But let me ask—do you recall the moment he came home and said his rent was being raised and he’d have to quit farming?”

“He was angry. He yelled,” Olga said. “They’d increased production. But then the new chairman raised the price on him, charged more for land, cows, everything. The agreement they were offered would have meant they’d be farming for no pay at all. Volodya said it was designed to make them quit. They weren’t expected to sign it.”

“If there was any way they could have continued,” she said, “they wouldn’t have quit. The herd of 200 cows they were supposed to get—that was phony, too. The men wouldn’t have had freedom to work right. There were other bosses running that barn as a standard work brigade. And those cows were very bad, very old. Volodya was sup-

posed to give back the herd they had improved and start all over again. It repelled them to contemplate going back to working with people they couldn’t trust.

“But the big reason may have been that so many farm residents were against them, and told them so openly. Do-nothings came by. ‘We can do without you,’ they said, and ‘Your cows are hungry.’ People came right into the barn and found fault with them.

“I believe you can’t even blame those people—Volodya was doing something new. I blame the farm authorities: the new chairman and the farm economist. The chairman met the economist’s demands. Nikolai Petrachkov could keep her in line, but the new chairman didn’t. She was against Volodya from the start. They struggled to the last day, and right up until then he hoped to stay. She said, ‘Stop farming.’ The collective farm sent in men to close the brigade. They actually went in and moved the cows. Volodya learned something—he’ll never start such a business again.”



we drove fast and Yelena and I caught the night train to Moscow seconds before it left. After a while, the rocking train calmed us. Such rides had become intermissions. Yelena, whose graduate studies were in agricultural economics, stared out at the passing farms as the scenery faded into darkness. “It’s too easy to say Volodya was kicked out by the economist and leave it at that,” she said. “I think Volodya’s problem wasn’t the economist, or the new chairman. The problem is that up to now our people have rejected new structures. Volodya was too visible. Life on a farm is too open. In factories there are successful lease brigades. Our leaders thought the form would fit agriculture best, and it hasn’t. Those six or eight workers set a pattern that might have spread and taken away the jobs of half the villagers.”

At 5:30 in the morning, the train groaned into Moscow. I caught a few hours sleep and that evening had supper with Viktor Lishchenko, the reform agricultural economist who’d pointed me toward Ivanovo. He was more outspoken than usual. He said he was not surprised to hear that Volodya had been thwarted. “The system we evolved rejects innovations the way a body rejects foreign matter,” he said, “which has caused our descent in the world economy. Our country is full of innovators, but the system rejects them all. Volodya’s successful lease brigade was a showcase that proved the system is wrong. So he was wiped out. When economic adventurousness is permitted in the USSR, that muddled reach for progress still retains centralized management, leading again and again to the same fate for energetic, creative people.” His words made me wish that I’d met up with Volodya again. I still wanted to know how this aspiring entrepreneur had fared.

**The established
system rejects
innovations the way
a body eliminates
foreign matter.
Volodya’s
successful lease
brigade challenged
the system and
proved it wrong, so
he was wiped out.**

Two years later, in 1992, I was back in Russia, but much had changed. The previous August an abortive coup had led to the fall of the Communist Party and to Gorbachev's demise by year's end. I'd waited a season for the smoke to clear, then returned to someplace new. I was no longer the "American Delegation" when I traveled, no longer an official guest of official institutions, bound by official itineraries. I found my own translator, a dissident writer and historian named Sergei Sossinsky, who'd spent his teen years in Queens, New York, because his father had worked at the United Nations. We stayed not in hotels as party guests but on couches in the apartments of friends of friends, roughing it.

Sergei and I drove back to Shuya. We stood in Volodya's apartment house courtyard, where Loskutov had led us in 1990 and where I'd chatted with Volodya's wife. And there, as if materialized from a dream, stood Volodya, waving. Finding just the person I wanted to see, after so many controlled trips, had proved straightforward. Without political escorts, we'd just gone and done what we'd set out to do.

I remembered Volodya's puzzled, lopsided smile the moment I saw it again. He'd filled out. He'd prospered. His apartment was furnished with leather couches and beautiful Oriental rugs—not what I'd have expected of the hard-working would-have-been farmer. Fine icons hung on the walls. His wife served us liver, which was costly and "fresh from the market," she said—a lavish gesture of hospitality. She carried out tea and Metaxa brandy, sausages and bread, Swiss chocolates and cakes. "My life has changed so much," he said. "I'm another Volodya now."

And he was another Volodya. He'd struck me during our earlier visit as more directed than the average farm worker, but I'd missed his eloquence. He recalled the events of May and June 1990 that led to the end of his lease brigade: "The culprit who ruined my farm was Drozhin, the replacement chairman—not the chief zootechnician nor chief economist, although they also didn't like what we were doing. Drozhin was the kind of chairman who got irritated if he merely heard that something new was going on. We had worked hard the whole winter. The cows milked well. They all got with calf. And then the new calves were born, and none died; we'd given the farm excellent new cows. We'd replaced a quarter of our herd, and we were ready to go on working."

"There was a big meeting. The collective farm board came. Drozhin came. The city Party committee came. Sorokin, the big boss, even came, although he didn't speak. All Farm Trudovik's board members opposed us. But they accused us of just one thing—getting paid well. I told them, 'In that case, we will just throw everything away and start drinking like your regular collective-farm workers do. Then you'll be happy, because our wages will go down.' I was angry.

**Volodya had
become a poised,
worldly trader,
Russian style—
a wheeler dealer.
I felt downright
flummoxed that
I'd taken this
adept businessman
for an earnest
hayseed.**

"Near the end of winter, the collective farm just began dumping cow manure into our fields one day. They didn't spread it, just dropped truckloads of it. I asked, 'Why do you want to ruin our fields?' The field supervisor said, 'You won't be working on them anyhow.' I went over to Nikolai Petrachkov at Farm Gorky. He's a very serious man, the one I still respect among the area's chairmen. Couldn't I move with my crew down the road and join him again? He was friendly. But he said that he didn't have room.

"Soon Drozhin said if we didn't get out of the barn, they'd simply flatten it with a bulldozer and kill the cattle. I'd taken care of those cows for a year. I felt sorry for them. I yelled at him, 'You're a Communist—you should be thinking about the workers' prosperity, but instead you're thinking of murdering a good herd of cows. How can a farm chairman say words like that? What kind of master of a farm are you?'

"I drove right to Ivanovo and saw the deputy Party chief of agriculture in a big office. I told my story and got all excited. He pretended to listen, made a show of writing

something down, and that was the end. I worked exactly a year, May first to May first, International Workers' Solidarity Day—but solidarity with whom? They closed up our barn and drove the cattle back to a bigger barn in Putich. Someone told me that along the way 12 cows stopped and drank water into which ammonia fertilizer had fallen. They died. Even after that, I saw Drozhin once more and asked if he'd sell me the farm—not the land, just the farm building and a small plot. He said I didn't have enough money. I told him I had enough to buy his whole damned collective farm. I was pissed off, but after that I just went away."

If I'd missed Volodya's intensity and eloquence, I'd also underestimated his ambition and commercial skill. He'd worked hard at the lease brigade because he'd seen it as an opportunity to make good money. It had failed, but just as Volodya had spotted the chance to farm under Nikolai Petrachkov, he went about finding the next opportunity.

"I have a family, kids. I needed to work. It was still *pere-stroika*. Private cooperatives were suddenly allowed at that point. So we started a small construction cooperative. We repair schools, nurseries, invalid homes—only public buildings. We pay our workers good wages. So far, the state's reimbursements to us for our work are coming through OK.

"The enterprise also now has a 'commercial section.' We're middlemen—I'm not ashamed; a middleman takes risks. Our laborers did maybe 300,000 rubles' worth of repairs at a cloth mill. In exchange we got textiles worth that. We trucked them to Voronezh, where there is not much fabric, but there's a candy factory. For each kilo of candy that sells in stores (if you can find any) for 120 rubles, we

traded 60 rubles' worth of fabric. We sell the candies here for 80, 90 rubles.

"Our business is growing, but not as fast as it could. The country's falling apart. Someone else wants us to trade textiles for grain, which would be attractive—there's not enough bread in Ivanovo. But we'd have to make a preliminary payment, and we can't because the banking system has blown up. People line up at banks, and then the bank gives them only 500 rubles apiece from their own accounts. We have other troubles. Some companies that approach us are phonies, and we can't tell. There's absolutely no basis for mutual trust. And consumers aren't buying things, because they have no cash around." This was Volodya the plain dirt farmer giving me the lowdown. I was amazed.

"For 70 years our government tried to invent new economic laws. But you can't. The world lived according to definite economic laws already. We are making the transition back to what the rest of the world knew—provided the government isn't taken over by people looking backward. There is a danger—maybe not from Moscow, but from the provinces, where there are millions of workers who remember Brezhnev's era as a good time. It's so hard now for them to live."

"I'd like to produce something, not just be a middleman. But it absolutely can't be done now. I wanted to buy a brick factory, but land isn't being sold. You still can't get to own the land under a factory, never mind what Yeltsin decrees. I'd like to start a quarry. I know that the state's cost for producing bricks is very high. State structures would be no competition for us. I figured it out.

"I am also trying to start making flooring materials. I met a Pole in Moscow who was in a joint venture with Germans producing parquet flooring—high-quality products. There are empty warehouses just outside of town. We have equipment. We went to every official. But they wouldn't let us rent or buy a place to put the machines. You can't set them down in the open air. You need quarters, and land. We finally got space as part of a state enterprise, but I'm sure they'll soon see we're prosperous and keep cranking up the rent. They'll add their workers in with ours. They'll demand a share. We'll see. I'm just doing what I'm doing. I'm doing pretty well." He laughed. It was a businessman's excited laugh.

And then Volodya showed yet another side of himself: "All my life I've been fascinated by icon paintings. Tsar Peter the First visited here once to worship a certain icon. I almost went to jail for my interest in icons, so I stopped. But now you can do anything. Look at these icons—sixteenth century, nineteenth cen-

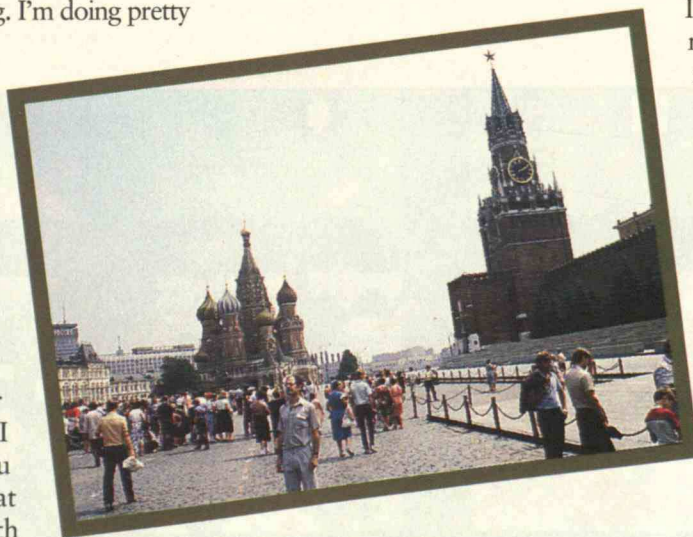
tury. The Communists destroyed an enormous number. Now they're getting harder to find. I travel around. People bring them to me, and I buy them. I paid over a thousand dollars for this," Volodya said, handing me a small icon of a doleful Mary. "I knew what I was doing. I confess—I'd go to Moscow and sell them. Russian customers paid a lot—they knew the good ones. Italians fell in love with them and showed it. But the Americans wouldn't show emotion. They'd just wander back three hours later and act cool.

"I have no scruples about the way I make money myself—except for criminal things. I've worked so hard that I have hardly been home for the years since I lost the farm. I'm slowing down a little now, but never on weekends. Then, I'm always in Moscow doing business."

I felt downright flummoxed that I'd taken this adept businessman for an earnest hayseed. He had become a poised, worldly trader, Russian style. A wheeler-dealer. That a black-market icon trader had seemed to be a man disposed toward constructive action and clear sight was a measure of the confusing moral context that Soviet power had spawned. They'd banned property and religion, and they'd stifled art, and Volodya had found a bold way to traffic in all three. I took it as a sign of a lively spirit in a tough spot.

My farmer of the future had landed on his feet. In fact, he'd been nimble all the while, eyes fixed on the opportunity at hand. How innocently I'd read him, in 1989, sitting in the hay shed, talking quietly so my keeper, Lev, wouldn't overhear Volodya's criticisms of Soviet farming. Volodya made more sense this way. A man who'd sought out the opportunity to farm independently, years before most citizens even understood the possibility, would notice other rewarding outlets for his industriousness. "The effects of bad laws in Russia are lessened by their bad enforcement," Marquis de Custine wrote a century and a half ago.

Over the next few days, I visited farmers who, like Volodya, had stumbled off on their own agricultural initiatives. A few were still in business. I was hunting for a success—a replacement farmer of the future, now that Volodya had moved on to commerce and the building trades. But I never found one. These young men limped along in the midst of local hostility, still as hemmed in by bureaucrats as ever—bureaucrats who just wanted to hang on to their own dominions. These individual farmers were still denied credit, supplies, machines, and markets. They were going nowhere, and would not go anywhere soon, although their nation would continue to need their sort of help. ■



The author in Red Square

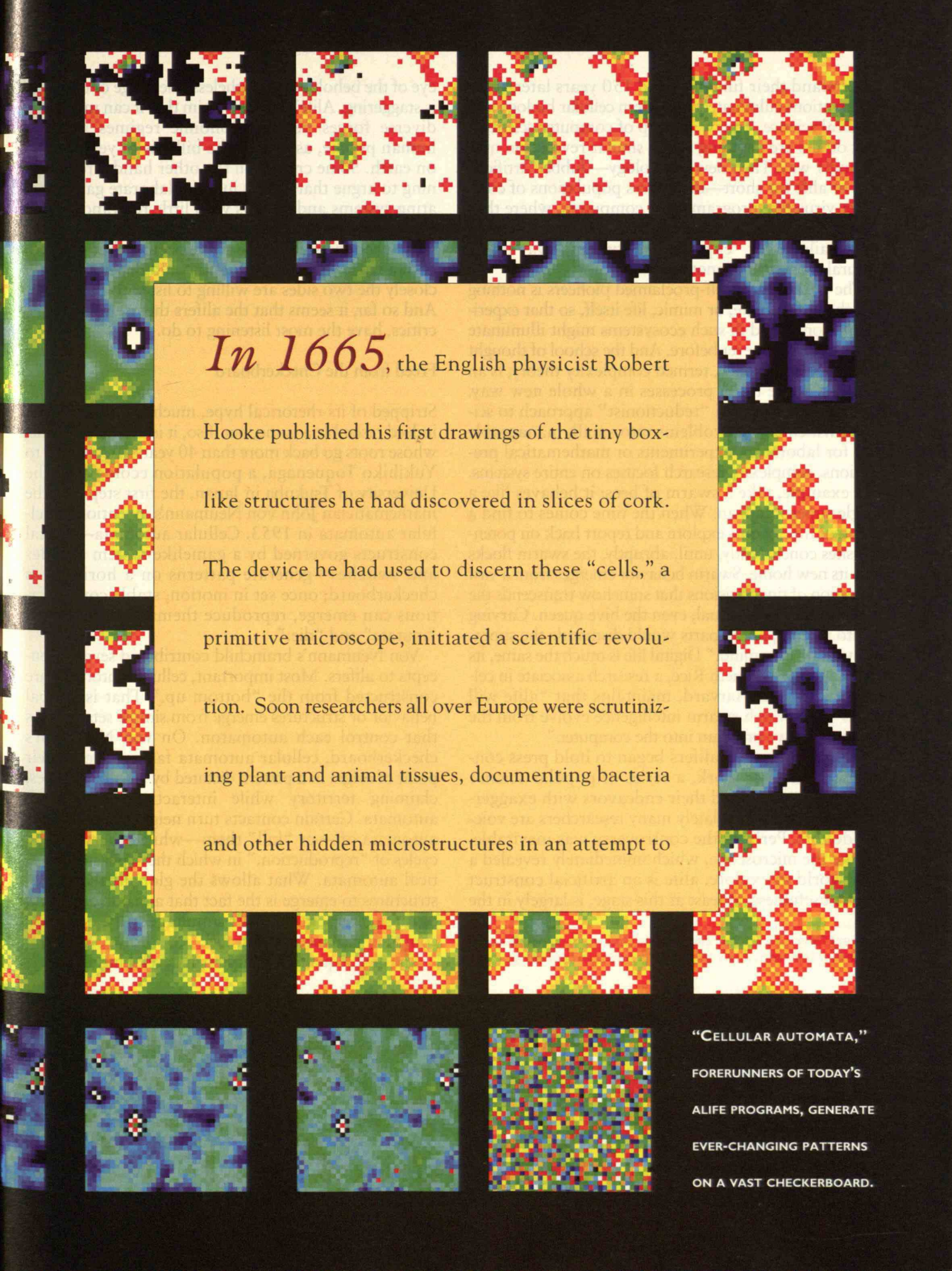


What's It All About, Alike?

BY ROBERT J. CRAWFORD

*Visionaries bent on creating "artificial life"
in computers hope to answer questions that have
long plagued a variety of fields.*

*But unless they establish some connection
with the material world, the larger scientific
community may continue to
dismiss their work.*



In 1665, the English physicist Robert

Hooke published his first drawings of the tiny box-like structures he had discovered in slices of cork.

The device he had used to discern these “cells,” a primitive microscope, initiated a scientific revolution. Soon researchers all over Europe were scrutinizing plant and animal tissues, documenting bacteria and other hidden microstructures in an attempt to

“CELLULAR AUTOMATA,”
FORERUNNERS OF TODAY’S
ALIFE PROGRAMS, GENERATE
EVER-CHANGING PATTERNS
ON A VAST CHECKERBOARD.

understand their function, and 150 years later, these observations culminated in modern cellular biology and medical science. Today, a group of computer scientists and others are claiming that a similar revolution may be under way. Their new technology—dubbed artificial life, or alife for short—introduces populations of computer-virus-like programs into computers, where they interact and eventually produce a kind of ecosystem, one available for “experimentation” in a way that a natural ecosystem cannot be.

The goal of these self-proclaimed pioneers is nothing less than to recreate, or mimic, life itself, so that experiments conducted in such ecosystems might illuminate life processes as never before. And the school of thought they hope to advance, termed complexity theory, is an attempt to see those processes in a whole new way. Unlike the traditional “reductionist” approach to science, which chops problems into small, manageable bits for laboratory experiments or mathematical predictions, complexity research focuses on entire systems. For example, take a swarm of bees: it behaves like a single superorganism. When the time comes to find a different hive, scouts explore and report back on potential sites concurrently, until, abruptly, the swarm flocks into its new home. Swarm behavior emerges from a vast collection of tiny decisions that somehow transcends the actions of any individual, even the hive queen. Carving it into its component parts would dismantle the supra-individual “hive mind.” Digital life is much the same, its advocates say. Kenneth Rice, a research associate in cellular biology at Harvard, maintains that “alife will allow us to watch swarm intelligence evolve from the simple rules we program into the computer.”

Since 1987, when alifers began to hold press conferences on their work, a series of popular science books have described their endeavors with exaggerated enthusiasm. But lately many researchers are voicing doubts. Perhaps the controversy was inevitable. Unlike the microscope, which immediately revealed a new world to explore, alife is an artificial construct whose usefulness, at least at this stage, is largely in the

eye of the beholder. Nevertheless, the range of opinions is staggering. Alife’s backers claim that it can model the diverse forces behind economic regimes and the human psyche, as well as the billions of years of life on earth. Some critics, on the other hand, are beginning to argue that alife is just an elaborate game, creating systems and models with little relevance to the world outside the computer. In fact, the truth may lie somewhere between these two extremes, but whether such a truth will ever be found could depend on how closely the two sides are willing to listen to each other. And so far, it seems that the alifers themselves, not the critics, have the most listening to do.

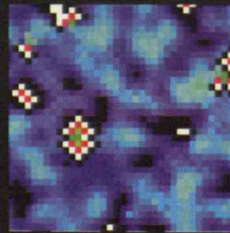
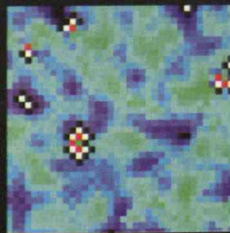
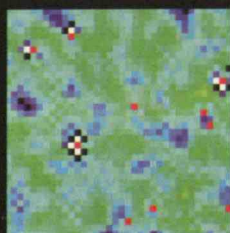
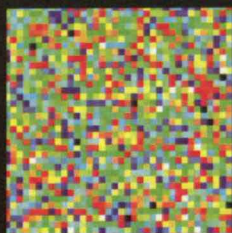
Freed from the Checkerboard


Stripped of its rhetorical hype, much about alife does indeed resemble a game, but if so, it is a venerable one, whose roots go back more than 40 years. According to Yukihiro Toquenaga, a population ecologist at the University of Tsukuba in Japan, the first step was the mathematician John von Neumann’s invention of cellular automata in 1953. Cellular automata—digital constructs governed by a gamelike system of rules and switches—generate patterns on a horizonless checkerboard; once set in motion, stable configurations can emerge, reproduce themselves, and even “mutate” and “die.”

Von Neumann’s brainchild contributed several concepts to alifers. Most important, cellular automata are constructed from the “bottom up.” That is, global behavior or structures emerge from simple sets of rules that control each automaton. On von Neumann’s checkerboard, cellular automata fan out from their point of origin in a pattern dictated by a set of 29 rules, claiming territory while interacting with other automata. Certain contacts turn neighboring cellular automata off—or “kill” them—while others initiate cycles of “reproduction,” in which they split into identical automata. What allows the global behavior or structures to emerge is the fact that a massive number of these interactions occur simultaneously, or, to use computer parlance, “in parallel.”

The next, equally crucial step in developing alife, says

ROBERT J. CRAWFORD, assistant director of the Office for Sponsored Research at Harvard University, writes frequently on science and technology.





LIKE REAL ONES, ALIFE ORGANISMS

CONTINUALLY MUTATE AND

EVOLVE NEW CHARACTERISTICS

TO ENHANCE THEIR

SURVIVAL ADVANTAGES.

Toquenaga, was the invention, in the mid-1960s, of genetic algorithms. Frustrated by the cumbersome approach of the first generation of artificial intelligence researchers, in which the programmer had to foresee every possible scenario and then develop specific instructions for the computer, John Holland of the University of Michigan came up with the idea of computer programs that could “evolve” to accomplish chosen tasks. No longer would breakdowns require laborious reprogramming to eliminate unforeseen bugs, Holland theorized. Instead, separately run genetic algorithms would produce a wide variety of alternative solutions and programs simultaneously—again, in parallel. These genetic algorithms, the product of random, computer-generated mutations in the software code, would undergo a form of natural selection as in animal husbandry: those with the greatest ability to adapt to the requirements of the situation at hand would not only be chosen to survive but replicate.

The innovation of alifers was to merge genetic algorithms with constructs similar to cellular automata but freed from the checkerboard. Such constructs could evolve on a wider scale through a vast number of generations. Unlike genetic algorithms, which were designed to perform circumscribed tasks, the alife programs were allowed an enormous range in which to pursue their own development. What alifers created, says Vincent Darley, a research associate at Cambridge University in England, were “evolutionary systems that are largely undirected.”

Because of the myriad factors interacting simultane-

ously, alife phenomena are often impossible to predict, and advocates maintain that this “nonlinearity” is a key asset. Previous computer models, Toquenaga explains, “had to impose global rules within which the entire system was governed.” Thus, virtual mosquito populations, for example, could expand or contract, but unlike real insects, they could not mutate and evolve new characteristics to enhance their survival advantages, such as the ability to thwart pesticides or exploit unforeseen parasite niches. Charles Taylor, a UCLA biologist who happens to be working with alife mosquito populations, charting their progress through virtual Africas, claims that “alife allows us to build model ecosystems that run in a more natural way,” continually recreating their own global rules. “Traditional [computer] models were too brittle,” he says. “Alter a single assumption and the whole system would stall or collapse into meaninglessness.”

Perhaps the most famous example of alife is Tierra, an ecosystem that evolves in the central processing unit (CPU) of the computer. From a single computer-code organism of only 80 instructions, which Tierra inventor Tom Ray, a biologist at the University of Delaware and the ATR Human Information Processing Research Laboratories in Kyoto, Japan, calls the Ancestor, an army of multifarious descendants emerge in a matter of hours, programmed only to replicate and compete for space in the CPU, with mutations generated by random flips of computer code—sometimes improving the organisms, but usually damaging and eventually killing them.





CRITICS ARGUE THAT WHAT SEEM LIKE

OPEN-ENDED BEHAVIORS IN ALIFE ARE

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THE PROGRAM FROM THE BEGINNING.

These alife organisms continually surprise Ray with their ingenuity. Parasites, devious survival strategies, and even a kind of “sex,” in which the virtual organisms swap computer code in order to reproduce, have appeared. Some of his organisms, Ray says, boil themselves down to a single instruction of code and trick other organisms into copying it—that is, into expending their own energy to carry out the reproduction of competitors.

“The hardest thing to get across to biologists,” Ray says, “is that Tierra is not a model. Digital organisms are a class of organisms in their own right, which don’t exist to model other organisms, just as bacteria don’t exist to model mammals.” Yet he also believes that because the medium is silicon, it offers opportunities other life forms cannot. Scientists could study life as it evolves under specific conditions, running experiments across millions of cybergenerations. Whatever patterns emerged—perhaps the explosive growth of new life forms, or the dominance of a certain type of cyber-predator—could be analyzed and endlessly replayed and manipulated in computer programs under different alife ecologies. And by analyzing the computer code, which Ray says is analogous to the genetic blueprint in animals, biologists might uncover clues to the relationship between genes, behavior, and development over a span of evolutionary cybertime.

Ray goes on to argue that Tierra and other alife ecosystems are beginning to reveal the mechanisms of “punctuated equilibria,” the sudden development of new species mysteriously indicated in the fossil record. Such a phenomenon may start when, for instance, an extraordinarily fit mutation—like the first alife predator

to appear in a Tierra run—produces many offspring that carry some, though not all, of its genes. Although these descendants lack the vital combination of genes that made the predator so fit, they spread the elements of its genetic instructions throughout the population during reproductive cycles. In a few generations, a kind of genetic critical mass is attained that allows a large number of such predators to appear simultaneously.

You Get Out What You Put In

Still, many of the scientists who should be interested in alife are skeptical. “Where’s the biological reality behind what [alifers] do?” asks Tomasz Baumiller, a professor of paleontology at Harvard University. He fails to see how runs of evolving computer-code organisms could supplement the incomplete fossil record he studies.

Even within the ranks of alifers, there is concern about the state of the field. For example, psychiatrist William Sulis of McMaster University of Ontario, Canada, intends to create a simulation whose evolving patterns will produce a dynamic model of the human personality, but he also believes that alife must become better grounded in a coherent theory or system. Otherwise, there could be little basis for scientific comparison between the many alife ecosystems being created. “As it stands,” he says, “lots of people are building fancy models with little regard to what they mean or whether they are really going to be useful.”

Peter Cariani, a research associate in auditory neurophysiology at Massachusetts Eye and Ear Infirmary, points out that the field of alife is dominated by com-



puter scientists and physicists who excel at abstract languages of reasoning but lack any real understanding of the issues they are attempting to explore. "[Alifers] tend to program first and question later," he says. "There's not much thought about what it all means, until they [have to] make their interpretations." Moreover, according to Cariani, computer simulations may inherently limit the range and usefulness of alife experiments, no matter what advocates say about nonlinearity and unpredictability. "They are closed, finite, and pre-defined entities," he notes. In other words, alife experiments may still be operating in circumscribed microworlds, so that what you put in is essentially what you get out. Even Tom Ray's *Tierra*, Cariani posits, cannot develop truly open-ended behaviors, but only permutations within permutations that are in fact contained in the program from the beginning.

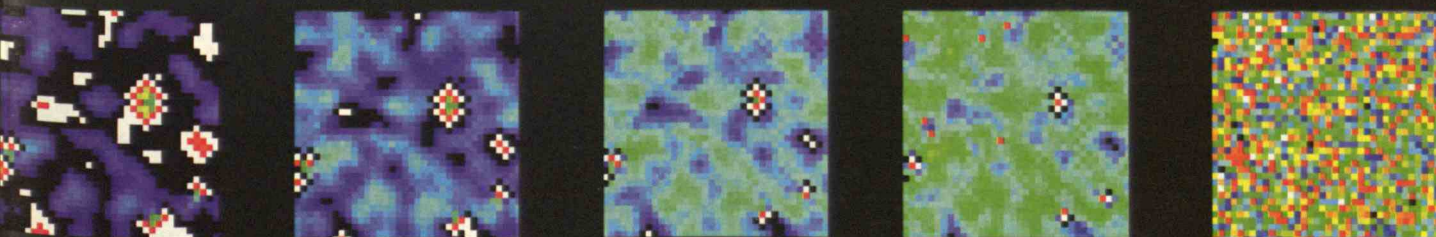
Harvard biologist Richard Lewontin concurs. Organisms, in his view, are continually changing the rules, and doing it in ways computer programs never could. For example, because of the outsized nutrient requirements of bacteria's organelles, the tiny parts analogous to organs, bacteria with a diameter greater than 100 micrometers were long assumed to be physically impossible. But recently a mega-bacterium, one large enough to be visible to the naked eye, was found, destroying the hypothesis. "I don't think you can model that kind of surprise," Lewontin says. He remains convinced that anything truly new—any quantum leap that destroys assumptions—is too complex to model in a computer program.

But Lewontin has hardly closed the door on alife. Though he says the technology "hasn't taught me anything yet," he concedes that he "wouldn't say it's impossible that it may." And Cariani, with all the criticism he levels at alife, also has some ideas about how to make it useful. One is to connect alife constructs to the material world. For instance, if used as part of the software for robotic devices, such constructs would have to measure—or at least perceive—objects outside of cyberspace. Perhaps, he speculates, the devices could evolve responses to novel situations they encounter, or even create new abilities that increase their range of action in physical space.

Keeping the Faith

Maja Mataric, a professor of computer science at Brandeis University, agrees with Cariani on the importance of venturing outside the computer. Having modeled cooperative movement in robotic insects, she believes that such physical systems are more useful than alife for studying complex behavior in animals. Granted, they are capable of far less sophisticated actions and growth than their cybercousins. While Mataric's robotic insects can ably organize themselves into columns that march around obstacles, they cannot reproduce or form societies and ecosystems that mutate and evolve through many generations in a matter of hours. That doesn't bother her, though. "Because computer models tend to vastly oversimplify the world, you can get results on them that simply won't work with robots," she says. Generating truly complex behavior, she argues, requires the "noise" and perturbations that occur only in the physical world: "The dynamics are completely different when you have to get these metal creatures to perceive each other and walk together."

Other researchers interested in complex behavior have bypassed the computer altogether, developing primitive lifelike simulations in chemical soups. For example, Julius Rebek, Jr., a professor of chemistry at MIT, is attempting to synthesize self-replicating molecules, which he hopes will illuminate rules governing the emergence of order in chemical systems. His goals are strikingly similar to those of many alifers. "There are four things," he says, "that I hope my molecules will do: replicate themselves; make mistakes that are heritable in the next generation and thus akin to mutant variations; distinguish themselves from the environment somehow, say by forming an enclosed membrane; and harness energy, so that they can keep going when they run out of the materials I supply to them." But he admits that he has attained only the first two of his goals. Interestingly, a large part of the challenge he faces in attaining the other two—getting his molecules to distinguish themselves from their environment and harness energy—lies in establishing more of a connection between them and the real world, the same criteria for success that Cariani has formulated.





Yet despite the concerns of mainstream scientists—and despite the results of researchers like Mataric and Rebec, which are substantial and significant, if somewhat limited—alife enthusiasts still shun earthly connections, confident that their medium alone is enough to penetrate the mysteries of complex phenomena. According to Walter Fontana, a professor of theoretical chemistry at the University of Vienna, Austria, the value of alife lies in helping scientists formulate new ideas. “What biologists need are concepts,” he argues, and it is “that which alife must deliver foremost...not data sets.” And Michael Levin, a graduate researcher in developmental biology at Harvard Medical School, sees the lack of standardization in the field as a sign of energy. In his view, such chaos reflects the freshness of alife as a discipline. “Variety is good,” he maintains, adding that the more tedious work of tidying up and duplicating other people’s work to test their results will come later. Right now, “there is simply too much more exciting stuff, and too few people working in alife,” he says.

According to Tom Ray, most older biologists lack the time and energy to seriously ponder what alife may have to offer. It is the younger scientists, he believes, those who can master computer science to enter new domains, who will make the greatest strides with this new tool. “In the end we may be disappointed,” he says. “But the potential payoff is so great that it is worth the effort.”

Unfortunately, such a modest show of intellectual humility is unlikely to sway Ray’s colleagues in the wider scientific community. The simple truth of the matter remains that because alife is based on the interpretation of computer simulations, it purports to be a science without hard facts. Indeed, it may be excluding exactly those factors that would make complex behavior fathomable, as the real-world simulations of Mataric and Rebec suggest. If alifers are serious about mainstream acceptance, they will have to find a way to link up with material reality. Otherwise their efforts will always suffer charges of subjectivity and irreproducibility. ■

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Getting High School Science in Order

WE have witnessed two spectacular conferences of world leaders in the past few years. Presidents, chancellors, prime ministers, and kings from more than 100 nations gathered for the Earth Summit in Rio de Janeiro in 1992 and again in Cairo in 1994. What were the exceptional issues that managed to bring all these eminent people together? In 1992 the theme was environment: such things as the ozone layer, global climate change, and biodiversity require the collaborative attention of all nations. And the issues of the Cairo meeting, the International Conference on Population and Development, were not independent of the agenda at Rio. Together, the conferences addressed the question of the

*In building
the science literacy that
is essential for informed
and active citizenship,
we must put first
things first.*

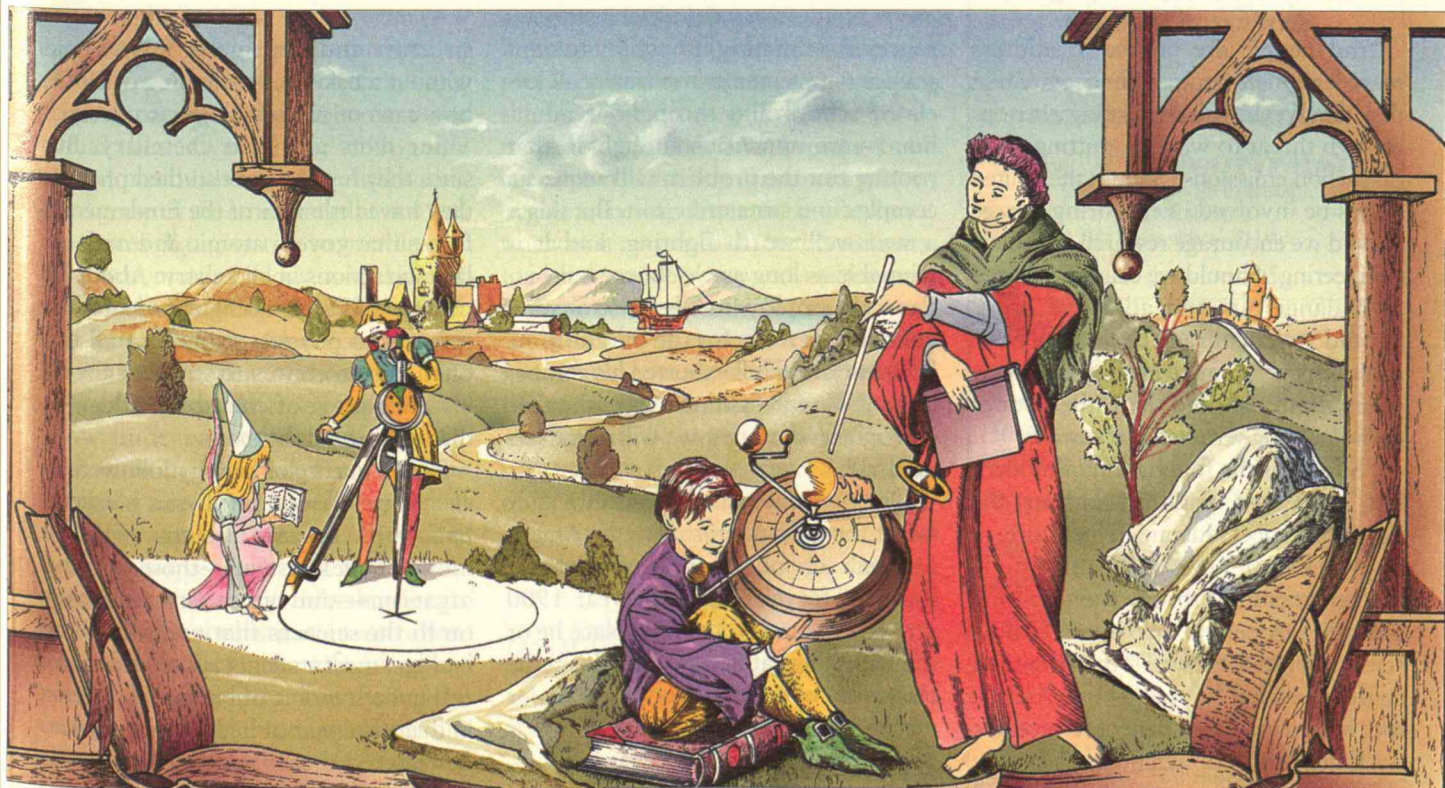
continued habitability of the planet.

Truly grasping these problems and formulating solutions requires some understanding of science and technology, not only by political leaders but

also by their constituents. Without popular consensus, even the most enlightened of decisions will not hold. And without popular pressure, leaders might never face the music in the first place.

Fundamental issues of survival provide perhaps the most pressing reasons why the citizens of the nations of the world must become more scientifically literate. But even apart from such dire possibilities, there is little doubt that science and technology are the driving engines of modern society, and that economic progress requires the ability to understand these powers and to participate in decisions on how to use them wisely.

Regardless of how they define it, however, professionals who measure



science literacy inevitably conclude that the public has very little. This lack of scientific savvy manifests itself on issues ranging from the ridiculous to the profound. People are distracted by such frivolous issues as: Should the CIA use "consultants" claiming to possess extrasensory perception? Are aliens abducting human beings? Should we teach creation "science" alongside modern biology?

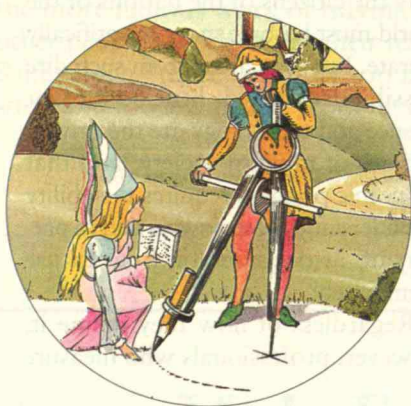
profound knowledge of the field, as well as for research and discovery in it, belongs to the scientist, but every cultured person must illuminate himself with its light, embrace its principles and procedures, and use its style."

Build a Strong Foundation

The causes of science illiteracy—the superficiality, misinformation, igno-

teaching sequence was devised.

This curriculum is usually a collection of largely disconnected courses that begins with biology, which, without a chemistry prerequisite, can only be descriptive—heavy on memorization and dense classification schemes to which are patched, often incomprehensibly, some of the many molecular aspects of modern biology. Without chemistry how can one convey, for example, the



Reversing the traditional order of scientific subjects would allow students to apply their new knowledge in successive years and to tap the mathematical skills they would also be acquiring.

And people are unable to address more legitimate issues with the attention they deserve: Is global warming a serious enough threat to warrant putting a tax on carbon emissions? Should the United States be involved in exploring space? Should we encourage research in genetic engineering? Should we classify tobacco as a dangerous and addictive drug? Should we encourage development of safer forms of nuclear power? How much money should the United States spend on long-term basic research?

"Science is the foundation of modern life," observed Naguib Mahfouz, the Egyptian Nobel laureate in literature, in his novel *Sugar Street*. "We must study the sciences and absorb the scientific mentality. A person who doesn't know science is not a citizen of the twentieth century, even if he is a genius. Artists, too, must learn their share of science. It's no longer just for scientists. Yes, the responsibility for comprehensive and

rance, and downright hostility toward science we encounter at virtually all levels of school and throughout adulthood—are numerous enough so that rooting out the problem will require a complex and sustained effort. But this is a war well worth fighting, and it is winnable as long as we choose our battles well, employ intelligent strategies, and hang in there for the duration. As Winston Churchill exhorted his compatriots: "We will fight on the beaches, we will fight in the cities, we will never surrender!"

One essential battle site—truly a juicy target for radical reform—is the American high school. It has been noted that if a time traveler from the year 1900 arrived here today, the only place he or she would feel at home would be in the classroom of a high school. One major reason is that the science curriculum is pretty much the same as it was one hundred years ago when the present science

structure and function of DNA? And without a basic understanding of DNA, how can one teach biology effectively?

Survivors go on to chemistry. But since they have not yet studied physics, they have little idea of the fundamental forces that govern atomic and molecular interactions in chemistry. About 20 percent of U.S. high-school students then proceed to physics, study that all too often fails to convey to students a solid understanding of concepts, hidden as they are behind the math.

This sequence of biology followed by chemistry followed by physics is exactly backward. Because it starts with the most complex systems—those of living organisms—and only afterward moves on to the sciences that underlie all of biology, most students fail to attain any real understanding of biological systems in their first year of high-school science. Bewildered, bored, and demoralized, many opt out of further science courses.

And we thereby lose our major opportunity to give all students access to the skills in scientific reasoning and problem solving that they will need to make their way in the modern world.

Critics of the high-school science curriculum were recently encouraged by two events: the publication of a set of standards for scientific knowledge, agreed on by a consensus of scientists and educators from around the nation; and the decision by school boards in New York and Chicago to phase in three-year science and three-year mathematics requirements for all high-school students.

Building on these advances, ARISE (American Renaissance in Science Education—a continuing workshop recently formed by scientists and educators) proposes creating a coherent three-year science sequence that reverses the traditional order of scientific subjects.

The ninth-grade course would focus largely on physics, taught conceptually using familiar language and deemphasizing mathematics so students can concentrate on the central concepts of motion, energy, heat, electricity, light, and the nature of the atom. Students would then advance to a tenth-grade course, mostly chemistry, armed with a good grasp of the structure of atoms and the forces that give rise to bonding. A third year, mostly biology, would impart an understanding of biological molecules that would come naturally as part of a broad understanding of chemistry.

The reversed science sequence would allow students not only to apply their new scientific knowledge in successive years but also to tap the mathematical skills they would be concurrently acquiring. The sequence would also enable participants to revisit crucial concepts with growing sophistication and allow teachers to assign inherently interdisciplinary projects such as analyzing the ecology of a pond or designing a habitable colony on Mars. In these kinds of efforts, each discipline would make its

contributions: physics in the first year, physics and chemistry in the second year, all three in the third.

Students' expanding sophistication—their appreciation of the basic principles of science and the intimate connections between disciplines—would allow teachers the freedom to modify and soften disciplinary borders. They'd have continuing opportunities to tell a little of the history of science and to teach some of the process of science, complete with its tentativeness, inherent skepticism, and cautious respect for wisdom handed down. Students could begin grasping the weave of science, technology, and society, launched solidly on their way to becoming informed citizens. In the meantime, they would have caught a glimpse of the beauty and wonder of the physical and biological universes.

Attempts to implement such changes in high-school science offerings will, of course, face enormous difficulties. They will require new teaching materials, assessment tools, laboratories, and, most important, procedures for recruiting and preparing science teachers. For example, the physics teacher will need to know more about biology and chemistry, and curriculum planners will require a greater degree of collegiality among all science teachers. It may not even be too visionary to include social science and arts teachers in these conversations. Science reform could then be a key to the renaissance of high-school education in the full sense of the word. But because these proposed changes will be expensive and resisted with tenacity, they will require a coalition of powerful supporters who see the urgency of a competent citizenry in the twenty-first century. ■

LEON M. LEDERMAN, a Nobel Laureate in physics, is director emeritus of the Fermi National Accelerator Laboratory and Pritzker Professor of Science at the Illinois Institute of Technology. He has long been an advocate of improved science education for all students and is one of the participants in the American Renaissance in Science Education workshop.

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WEARY from his flight, Jack heads for the car-rental counter. "Good afternoon," Jack offers, "I have a reserva—"

Eyeing a computer screen and with deadpan delivery, the rental car agent cuts in: "License and major credit card." The agent reaches for the proffered items.

Uncomfortable with the silence, Jack speaks: "Will you have the full-size sedan I reserved?" Ignoring the question, the agent hands Jack a contract, and recites a standard script about insurance and fuel options. Seeing that the form mentions a full-size car, Jack signs it and hands it back to the agent. "Next in line!" the agent yells, seemingly into the thin air above Jack's head. Jack interrupts: "Wait, I need a map and some directions! I'm staying at the Downtown Tudor Gothic Hotel." The agent walks away.

Jack is left wondering. Did the agent just take a break? Is he looking for a map? He returns a minute later and has already started talking before getting within reasonable earshot. Jack picks up a few words: "...north, second left, follow the signs to Bridge Street Exit—it's all in the directions." Eager to end this experience, Jack takes the map and directions, grabs his luggage and leaves.

Technically, Jack's needs were met—he obtained the type of car he reserved, along with directions and a map. But Jack was not a happy customer. His greeting was not reciprocated, his questions were not answered or even acknowledged, and the agent didn't even have the courtesy to excuse himself when he left to obtain directions. Most consumers have had this kind of encounter—if not at a car-rental agency then at a department store, an airline ticket counter, or a bank.

For many industries, service delivery is largely a rote activity—proceeding according to a script that covers the steps necessary to perform common tasks,



*Slavishly following
rigid scripts, some people
in the service professions are
more machine than human.
So why not just replace them
with computers, from which
we expect only efficiency,
not warmth?*

even to the point of outright rudeness. The customer is expected to provide answers to a standard set of questions; service personnel consider the customer as little more than a source of data. Following the script leaves little time for niceties such as a simple hello, eye contact, or even harmless conversation that does not contribute directly to completing the transaction.

Although such "no-service service" leaves customers feeling ignored, abused, and taken for granted, managers who rely on quantitative financial and production-oriented measures of success may be oblivious to this dissatisfaction. For example, a car-rental agent's performance may be based on indicators such as number of cars rented, dollars collected, or reservations made. Few agents

are adequately trained or motivated to provide explanations about the intricacies of, say, insurance options.

Automating the Automaton

The logical extension of this trend in scripted service is to turn the whole process over to computers. What better tool than a computer to implement transactions that place little value on the human touch? Computers are never gruff, brusque, or disdainful of their customers; computers don't get up on the wrong side of the bed.

With computers taking care of the rote procedures that constitute most transactions, they could free up a small contingent of human service employees to provide more friendly service for people whose needs fall outside the usual script.

Following the model of the banking industry's automated teller machines, we can now obtain postal services, maintain stock portfolios, buy transit fares, lottery tickets, and air travel tickets, and obtain myriad other services without ever interacting with a person. Brightly colored, easily readable screens can guide customers through a variety of complex transactions, in the process validating currency and reading the magnetic strips on the backs of credit cards and drivers' licenses. And although we'd feel insulted if a human bank teller took deposits or handed us cash with the cold, silent efficiency of an ATM, most people don't really mind that the bank machine doesn't chat amiably with them.

Ah, but you say: Is it really the point to replace an unfeeling, unresponsive, programmed human service provider with an unfeeling, unresponsive, rigidly programmed computer? Why not instead have empathetic and responsive human service providers? Why couldn't the rental-car company and other service businesses train, measure, and reward their employees so as to improve the human quality of service?

The answer is that it is too late. Americans have become tolerant of the impersonality and inflexibility of computerized service, accepting speed and convenience in exchange. Indeed, as computers become more powerful and less expensive, their use becomes a competitive imperative, as they can provide reliability, accuracy, and availability approaching 100 percent. Imagine the cost savings if a company puts automated car-rental machines in the country's major airports, and thus requires only half or a quarter as many employees at its rental counters. Competitors who resisted the trend and continued to use human service providers would find themselves at a severe cost disadvantage unless they charged customers a substantially larger fee for the privilege of interacting with a human—and it isn't clear how many people will want to pay such a premium.

Jack Rents Another Car

Let's follow Jack through a car-rental experience at some point in the not-too-distant future. Having just flown into town, Jack heads not for the rental

counter but for a kiosk containing a machine that resembles an ATM. The screen displays a brief menu, and Jack selects the option to pick up a car. The screen now directs him to insert a credit card and driver's license. Jack obliges and is greeted on screen: "Thank you, Mr. Jack Smith. Welcome to Gotham City." Zipping through a couple of menus, Jack confirms his reservation. After a few seconds and some odd mechanical sounds, a drawer opens to reveal a set of car keys and a rental contract. "Please take your keys, Mr. Smith. Your car is in the space noted on your contract." As Jack grabs the keys, he notices a new menu, offering options for directions, maps, further reservations, and, finally, a video conversation with a flesh-and-blood agent.

Jack gets his directions and map and retrieves his credit card and license. "Thank you, Mr. Smith," the screen displays. "Please drive carefully."

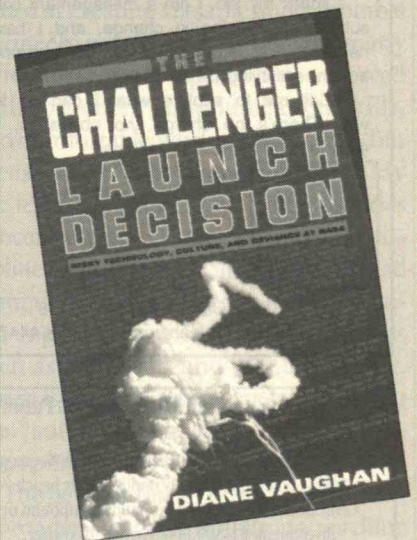
Jack walks away with a satisfied smile—you might even say a smirk—on his face. His car-rental service experience was at least as quick and precise as before, when he was dealing with a human. But because he did not have to deal with an aloof, uncaring agent, gone was the gnawing sense of having been treated like a nonperson. Paradoxically, by interacting with a computer instead of a human, Jack avoided a dehumanizing experience.

There is not a large difference, after all, between a computer and the kind of stoic service agent that many of us now encounter. Both stick mindlessly to their programmed procedures. But the callous human agent left Jack feeling slighted. A computer rental machine that did exactly the same thing would leave Jack feeling merely that his business had been handled efficiently. ■

ERWIN V. MARTINEZ is a partner with CSC Consulting and System Integration in San Bruno, Calif., an arm of Computer Sciences Corp. that builds computer systems for businesses.

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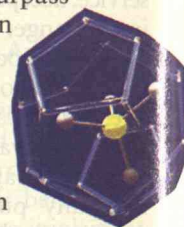
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NO GO ON GAS HYDRATES

In "Harvesting Natural Gas from the Ocean Floor" (*Trends, TR October 1995*), David Graham indicates that the drilling depths of rigs used to reach gas hydrates will need to surpass ocean oil rigs, which "can drill to depths of about 500 feet." Oil rigs in the Gulf of Mexico typically reach depths of 10,000 to 15,000 feet while wells in Mobile Bay approach 22,000 feet.



The central problem in harvesting these deposits of gas hydrates is economics. Many gas wells produce "on their own" because of natural pressure in the reservoir. With today's natural gas surplus, investing money in producing hydrates would not pay. Until natural gas becomes scarce or very low-cost production methods are developed, gas hydrates will not be economically viable.

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Gas hydrates are neither very new nor just a laboratory curiosity. For at least the past six decades, they have posed a daily problem in the world's oil and gas fields. Their ice-like nature obstructs pipelines and other surface facilities and is controlled with heat or injections of methanol or ethylene glycol. And subterranean hydrates are not confined only to deep water; massive onshore deposits in and under permafrost also exist—most notably in Asia, Canada, and Alaska.

Will gas hydrates ever be commercially viable? In Siberia, they already are at an onshore gas field where gas hydrates become accessible as field pressure declines owing to the production of conventional natural gas. In general, however, I doubt that gas hydrates, particularly the subsea ones, will ever be a viable source of energy.

ARLIE M. SKOV

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Arlie M. Skov was the director of production technology for British Petroleum Exploration.

“THERE are very many things besides engineering which go into the making of a real engineer.” Thus spoke the president of Stanford University in 1902, contemplating the engineering curriculum at the beginning of a new century. Just about everybody agrees that this statement is truer now than ever. Engineers confront systems of greater and greater complexity. Problems encompass multiple technical disciplines, plus economic, ecological, and political factors. Engineers are plunged willy-nilly into working associations with people of all sorts, and to be effective they must be familiar with that rich mix of tradition, zeal, and caprice we call “culture.”

To address these needs, Simon Ramo, cofounder of TRW, has called for a “greater engineering,” encompassing more of the nontechnological realm. Norman Augustine, chief executive of Martin Marietta and chair of the National Academy of Engineering, summons engineers to help formulate public policy. Donald Schon, professor of urban studies at MIT, has written of “the reflective practitioner,” the professional who participates in broad societal conversations. I have used the terms “civilized engineer” and “introspective engineer,” while the editors of *Technology Review* have chosen to call this column “The Humane Engineer.” But do these words amount to ineffectual exhortations—like so many sermons against sin—or is something significant, at long last, really going to happen? Will we truly change the way engineers prepare to face the complex challenges of our time?

Engrossing news on this topic comes from an unexpected quarter: Eastern Europe. Last spring, the European Society for Engineering Education (SEFI) convened an international symposium entitled “Educating the Whole Engineer: The Role of Non-Technical Subjects in Engineering Curricula.” The setting for this gathering was the Cracow University of Technology in the ancient city of Cracow, Poland. Delegates from 12 nations concurred that the humanities and social sciences “are vital for the full intellectual

The Whole Engineer

*Eastern Europeans,
working with the
benefit of a blank slate,
may show the U.S. how
to redefine what it
takes to be an engineer.*



SAMUEL C. FLORMAN

development of an engineer.” SEFI’s curriculum development group is making formal recommendations along these lines.

This event strikes me as especially significant not only because of its content, but because of its setting. The seminar’s theme originated at universities in Central and Eastern Europe—institutions that are developing new curricula in the wake of historic political transformations. The need to recreate a state includes thinking anew about what sort of engineering education best suits the needs of a free society. Is it possible that these newly emancipated nations, starting with relatively clean slates, will step into the future more boldly and wisely than we Americans, constrained as we are by past practices? I am reminded that the destruction in World War II of Japan and Germany’s industrial infrastructure contributed to these countries’ rapid adoption of superior technology, which in turn fed miraculous economic growth.

This is not to say that engineering education in the United States is stagnant—

far from it. In the wake of numerous conferences and urgent reports, and with considerable support from the National Science Foundation, curricular changes are occurring. The September 1995 issue of *IEEE Spectrum* featured an article entitled “Educating the Renaissance Engineer” that described new cross-disciplinary programs at engineering powerhouses such as Carnegie Mellon and MIT.

These initiatives sound admirable, aimed at creating versatile and adaptable engineers who are at home with many different technical specialties, endowed with top-notch communication skills, and comfortable working in groups. But “renaissance” is an overstatement, to say the least. Programs at U.S. universities concentrate on blending engineering disciplines such as electrical engineering and computer science, or at most on combining engineering with other allied fields such as chemistry and manufacturing. There is conspicuous silence concerning the “softer” liberal arts—notably history, philosophy, and literature.

The new European thrust, by contrast, is broader and more ambitious, reaching beyond the technical to emphasize the auspicious effect of humanistic studies on the engineer-citizen. A summary of the gathering’s proceedings is replete with references to leadership, social responsibility, environmental awareness, and protection of “our cultural heritage.”

Although SEFI’s members still have before them the task of translating bold concepts into curricular change, educators of American engineers might well heed the enthusiasm and fresh vision emanating from Eastern Europe. I believe that our own aspirations are less daring than they might be. In any event, let us happily add the phrase “whole engineer” to the lexicon by which we try to describe the ideal professional. It is a simple term, without pretentious overtones—perhaps the best expression yet conceived to depict our hopes for the future. ■

SAMUEL C. FLORMAN is a civil engineer and builder. His latest book is *The Introspective Engineer*, published in March (St. Martin’s).

Why We Need the Feds

Four powerful reasons why the federal government must maintain a strong hand in the nation's economic development.



BENNETT HARRISON

IN the budget deals being negotiated between Congress and the White House, and in the presidential campaign now under way, much more is at issue than the need to settle financial accounts. We are engaged in nothing less than a national debate about the proper boundaries of the reach of the national government. Even if we had the revenue, or were willing to tax ourselves at the rates that our foreign allies do to obtain it, we would still have to resolve the question: What should we continue to ask the feds to do to promote the nation's economic interest?

For the past year, I and 10 colleagues from universities around the country have been exploring exactly this question at the behest of the U.S. Department of Commerce. We have constructed a short list of reasons why a vital, well-funded federal government presence in economic development policy is essential, all fashionable talk about "devolution" of power to the local level notwithstanding. Here's what we have come up with.

Uniformity. Many federal programs came into existence earlier in this century when the patchwork of uneven rules and regulations across states led everyone from corporate lawyers to unions (and even some state governments) to call for a "simpler" system of nationwide standards. Unemployment insurance, child labor laws, welfare programs, and public works all share this history. In a country with so much variation in local resources, attitudes, and industrial and demographic composition, the national government can establish a common set of goals and standards.

For example, federal expenditures for business assistance are almost always held to such goals as reducing unemployment or maintaining passenger safety in air and train travel. These social objectives are not always met, but the commonly agreed-on goals become part of the discussion. By contrast, we can be pretty certain from past experience that in the absence of federal involvement, some localities will hand out money to businesses without any serious attempt

to ensure that the activities being funded will adhere to widely shared standards.

Stability. Because the composition of companies and industries across states and localities varies so much, short-term business and long-term product cycles go up and down at different times as well. Right now, for instance, Ohio's technologically and financially refurbished (if considerably downsized) factories and mills and its insurance sector are booming, while California, with its depressed aerospace industries, is in trouble. On a smaller scale, economic conditions may turn crucially on the policies of one or a few companies, as when New York's Hudson Valley was devastated not long ago by IBM's massive restructuring. And it is only in the last five years or so that Seattle's economy has become sufficiently diversified to free itself from life-or-death dependence on the fortunes of Boeing. Federal funding, which is independent of these local idiosyncrasies, smooths out regional cycles of growth

and decline. A related point is that the federal government alone can supply transitional aid to regions that bear the economic brunt of shifts in national policy, such as the closing of military bases.

Patience. Much of the economic development support that Washington provides is in the form of long-term, low-interest loans and outright grants to companies and research institutions—that is, "patient capital." State and local packages, by contrast, consist to a greater extent of short-term loans. While private foundations sometimes match the federal government's long time horizon, their investments cannot begin to substitute for what Washington provides. And the flip side of patience is equally important. For example, federal policymakers bite the bullet and actually evaluate the cost-effectiveness of development policies, at least sometimes killing off those that don't work—an unpopular task that states have been much more reluctant to do in their own programs.

Social justice. The federal government remains the principal guardian of poor and minority citizens. This is especially important when competition among state and local governments to attract and retain business is again heating up to fever pitch. The money doled out to lure businesses is not available for redistributive social policy.

In sum, the national government has established itself as a valued, sometimes indispensable, often innovative partner in economic development. That's why contemporary political efforts to eviscerate any sort of meaningful federal role in such activities are bound to fail. It will be the partners and beneficiaries—private business, state and local governments, community organizations, and the citizenry at large—who will ultimately call for the reinstatement of national government as leader or partner, just as they have in the past. ■

BENNETT HARRISON, visiting professor of political economy at Harvard's Kennedy School of Government, is author of *Lean and Mean: The Changing Landscape of Corporate Power in the Age Of Flexibility* (Basic Books).

Reviews

BOOKS

A BOMB IS BORN

Dark Sun: The Making of the Hydrogen Bomb
by Richard Rhodes
Simon & Schuster, \$32.50

BY JONATHAN B. TUCKER

AMID the heated controversy surrounding the fiftieth anniversary of the U.S. atomic bombing of Japan, another historical conundrum has been largely overlooked: President Truman's subsequent decision to develop vastly more destructive hydrogen weapons. *Dark Sun* by Richard Rhodes, the sequel to his Pulitzer Prize-winning *The Making of the Atomic Bomb*, describes the political and technological nexus that spawned the H-bomb program. Based on a multitude of historical sources, including memoirs, interviews, FBI files, and recently released Soviet documents, the book provides new insights into the relationship between physicists and politicians during the Cold War.

The antihero of *Dark Sun* is Edward Teller, a Hungarian emigré physicist who worked on the Manhattan Project. Even before he and the other Los Alamos scientists had succeeded in building atomic bombs based on the fission of the heavy elements uranium and plutonium, Teller became a passionate advocate of using the heat of an A-bomb blast to set off a second, "thermonuclear" explosion, which would be based on the fusion of the light element deuterium, an isotope of hydrogen. Teller argued that this reaction, the same one that lights the sun and the stars, could produce a device whose explosive power would dwarf that of the A-bomb. Indeed, theory suggested that the fusion of one gram of deuterium atoms would release the energy equivalent of 150 tons of TNT.

One of the roadblocks Teller encountered in the beginning was technical.



For six months in late 1945 and early 1946, he and his small team of physicists used the world's first electronic computer, ENIAC, to model his initial H-bomb design, which Rhodes refers to as the "classical Super." Much to Teller's chagrin, the computer simulation indicated that the bomb would fizzle. There were political obstacles as well: after Hiroshima and Nagasaki, most scientists and politicians had no stomach for creating more powerful nuclear explosives. Indeed, in 1946 the Truman administration proposed a visionary plan for international control of atomic energy under the auspices of the United Nations.

Despite these setbacks, Teller and his colleagues persisted in their theoretical work. In April 1946, the Los Alamos laboratory held a "Super Conference" to discuss conceptual designs for an H-bomb. In attendance was Klaus Fuchs, the physicist/spy who had earlier betrayed the secrets of the U.S. atomic bomb to the Soviet Union. On August 29, 1949, the Soviets would test their first atomic device, dubbed "Joe 1" in honor of the Kremlin leader. Thanks to Fuchs's treachery, the Soviet A-bomb would be an exact copy of the American device tested four years earlier in the New Mexico desert. Fuchs also passed information about Teller's H-bomb pro-

ject to the elite team of Soviet nuclear physicists who were laboring under the watchful eye of Stalin's ruthless secret police chief, Lavrenti Beria. Sometime in 1946, they launched their own H-bomb effort.

Rapid Buildup

Although the full extent of the Soviet nuclear-weapons program was unknown to U.S. officials at the time Joe-1 was exploded, that test sparked intense debate among the Atomic Energy Commission's panel of scientific advisers, which President Truman convened in 1949 to discuss the wisdom of developing the Super. Advocates such as Teller insisted that the H-bomb was indispensable to U.S. national survival, and that if the Soviets were to develop it first, "our situation would be hopeless." Critics such as J. Robert Oppenheimer, formerly chief scientist of the Manhattan Project, opposed building the Super on moral grounds. The lethal radius of an H-bomb would be so vast, he argued, that its use could not be restricted to military targets and would inevitably result in the wholesale killing of human beings, carrying "much further than the atomic bomb itself the policy of exterminating civilian populations." Oppenheimer urged the president to renounce the Super and invite the Soviets to follow suit. He went on to point out that if Moscow still developed an H-bomb and threatened to use it, the U.S. would have a large stockpile of A-bombs with which to retaliate.

Secretary of State Dean Acheson was skeptical, however, that the United States could persuade a paranoid adversary to disarm by example, and the Joint Chiefs of Staff argued that it would be "foolhardy altruism" for the country to voluntarily weaken its military capability by renouncing the H-bomb. As for Truman himself, the idealism that had inspired his plan for international control of atomic energy had faded in the face of growing Cold War tensions. Indeed, *Dark Sun* offers persuasive evidence that Truman had decided to pro-

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ceed with a crash H-bomb program before asking the advice of the atomic scientists, and that he had assembled them merely to make it look as if he had reached his decision through an orderly process. Although Truman had no desire to use the H-bomb in war, he saw it as a vital source of political leverage in negotiations with the truculent Soviet leadership. Moreover, even in the unlikely event that Moscow would agree to a joint ban on such weapons, he knew that the Pentagon and powerful members of Congress would fight him if he failed to forge ahead with the H-bomb program.

The next watershed came in 1951, the year Teller and the mathematician Stanislaw Ulam developed an ingenious design for an H-bomb that used the radiation emitted by a fission explosion to implode a capsule of deuterium fuel, compressing and heating the deuterium atoms to fusion temperature. Whereas the yield of an A-bomb is limited because fission reactions can generate just so much explosive power before the critical mass is blown apart, the size of a two-stage thermonuclear blast would be constrained only by the amount of deuterium fuel—making it theoretically unlimited. When Teller and Ulam presented their scheme to a meeting of atomic scientists at Princeton, its elegance seemed to banish the moral qualms of the H-bomb critics. Even Oppenheimer was won over. "When you see something that is technically sweet," he admitted, "you go ahead and do it and you argue about what to do about it only after you have had your technical success."

Rhodes steps back from his historical account at this point to ask why "technical promise should decide questions of politics and morality." Beyond the Faustian hubris of the atomic scientists, the answer seems to be that the political and ethical context of the H-bomb debate had shifted significantly since Teller and Oppenheimer had squared off in 1949. Fuchs's espionage had been exposed, and once U.S. scientists had conceived of a workable H-bomb de-

sign, it was reasonable to assume that the Soviets would hit upon the same idea sooner or later. The Cold War was also at its zenith: a bloody proxy war was raging in Korea, and many feared that the conflict might spread to Europe and trigger World War III.

Thus, in the wake of the Princeton conference, construction of the first H-bomb prototype proceeded with all deliberate speed. *Dark Sun* reveals publicly for the first time the detailed engineering design of the device, code-named Mike, whose massive bomb canister was 20 feet long and incorporated a sophisticated cooling system for the liquid deuterium fuel. Rhodes also makes the destructive power of Mike vivid for the reader. An atmospheric test of the bomb conducted in November 1952 at Eniwetok Atoll, 3,000 miles west of Hawaii, produced an explosion that expanded in seconds to a blinding white fireball more than three miles in diameter, vaporizing the coral island of Elugelab. Its force was equivalent to 10.4 million tons, or megatons, of TNT—more than 600 times the yield of the bomb dropped on Hiroshima.

In August 1953 the Soviets tested their own H-bomb, developed by a team of physicists led by Andrei Sakharov. A less sophisticated design, "Joe 4" exploded with a yield of just 400 thousand tons of TNT, but that was enough to get the nuclear arms race under way in earnest. Although the United States never lost its technological lead, Teller and other influential hawks pushed for a rapid nuclear buildup. They continued to perceive the United States as endangered and did not believe that a ruthless and secretive rival like the Soviet Union would ever accept a stalemate.

The final act of the H-bomb drama came in June 1954, when, after three weeks of hearings, the Atomic Energy Commission decided to strip Oppenheimer of his security clearance, excluding him from any role in internal government deliberations on nuclear policy. This decision left Oppenheimer a broken man. *Dark Sun* makes clear that despite some blots on his record, such

as the failure to report an approach by a known Soviet agent, Oppenheimer was judged a security risk primarily because Teller had informed the FBI that he had opposed the H-bomb and delayed its development. Together with the Super debate of the Truman administration, the Oppenheimer "trial" divided atomic scientists into opposing camps and aroused bitter feelings that were to linger for decades.

The Edge of the Abyss

In a coda titled "Scorpions in a Bottle," Rhodes graphically describes the consequences of two superpowers armed to the teeth with nuclear weapons. He provides chilling evidence that the United States and the Soviet Union came far closer to the nuclear abyss than is commonly believed. In November 1955, three years after the Mike explosion, the Soviets tested their own staged, megaton-range H-bomb. Over the next decade, Strategic Air Command (SAC) chief Gen. Curtis LeMay, convinced that U.S. nuclear superiority was a wasting asset, sought repeatedly to provoke the Soviets into a high-level nuclear alert—by flying reconnaissance aircraft over Soviet cities in broad daylight, for example. If Moscow had taken the bait, LeMay was prepared to launch a preemptive attack with as many as 750 nuclear bombs.

Rhodes also reveals that at the height of the 1962 Cuban Missile Crisis, Gen. LeMay, operating without the president's knowledge or authorization, ordered SAC bombers carrying thousands of megatons of H-bombs to fly past their turnaround points toward Soviet airspace—an unambiguous threat that Soviet radar operators certainly would have detected and reported. In the aftermath of the missile crisis, an appalled President Kennedy ordered that electronic locks be placed on most U.S. nuclear weapons to ensure civilian control over the arsenal.

Although *Dark Sun* makes for compelling reading, a major flaw of the book is that it attributes too much influ-

ence to colorful personalities such as Teller, Oppenheimer, and LeMay and neglects the faceless bureaucratic forces that played a dominant role in fueling the nuclear arms race. Whenever a revolutionary new weapon system was developed—be it the H-bomb, the intercontinental ballistic missile, or the multiple warhead—it acquired powerful and mutually reinforcing constituencies in the national labs, the defense industry, the Pentagon, and Congress that nearly always prevailed over moral or strategic objections. Also, interservice rivalry contributed to the creation of redundant nuclear forces deployed at sea, on land, and in the air, as well as an array of battlefield nuclear weapons. Strategic doctrines were developed after the fact to rationalize the weapons that the arms race had imposed on both superpowers.

While arms-control negotiations helped to manage the nuclear competition, they failed in most cases to slow the pace of technological advance. Thus, a key lesson of the Cold War is that the only way to avoid destabilizing arms races is for the major powers to negotiate mutual and verifiable constraints on the development and testing of new weapons before they are deployed. The current international negotiation to establish a comprehensive ban on nuclear testing is a promising step in this direction.

Quantitative restrictions on nuclear weapons are urgently needed as well, including prompt implementation of the START II treaty and the initiation of follow-on talks to make even deeper cuts in existing inventories. Today, some 17,000 deployed strategic nuclear warheads remain in the stockpiles of the world's declared nuclear powers. Unless deliberate measures are taken to reduce the size and alert status of these arsenals, the dark sun of the thermonuclear fireball will continue to shed its ominous light over the future. ■

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BOOKS

THE EMPEROR'S VIRTUAL CLOTHES

War of the Worlds

by Mark Slouka

Harper Collins, \$20.00

BY ELLEN SPERTUS

ALMOST 50 years ago, the essayist E. B. White foretold that modern technology would create illusions vivid enough to encroach on people's lives. Just months after his prediction, Americans were panicked by Orson Welles's radio broadcast of H. G. Wells's *War of the Worlds*, for which Mark Slouka's book is named.

Slouka, who teaches literature and culture at the University of California at San Diego, voices the same concerns as White, but with a focus on technologies that White never got to see. What concerns him, he explains, is how online culture could change our ideas about what is real. Viewers of television sometimes have trouble distinguishing between the actors and the characters, and with the Internet and virtual reality, the potential for confusion is arguably much greater. Not only can we see an imaginary piece of wood, for example, but we can feel its weight and swing it around. Problems can also arise as people adopt different identities online and are treated accordingly.

War of the Worlds is not the only recent book questioning the benefits of cyberspace; Clifford Stoll's *Silicon Snake Oil* and James Brook and Iain A. Boal's *Resisting the Virtual Life* come immediately to mind. And such skepticism is much needed, especially since not everyone singing the praises of computer technologies is to be trusted. After all, it is in companies' interest to convince people that they need virtual reality and Internet access in order to lead full lives.

Unfortunately, too, little criticism has

met Kevin Kelly, who argues in *Out of Control: The Rise of Neo-Biological Civilization* that individuality is an illusion and will be swept away as human beings are fused with computer networks into a global "hive mind." Kelly, as it happens, is not a harmless crackpot but the executive editor of *Wired*, the hugely successful magazine on cyberspace and business. Then there is the troubling fatalism common among cyberspace advocates, such as John Perry Barlow, co-founder of the Electronic Frontier Foundation, a group that fights for free speech in cyberspace. When Slouka asked Barlow about the advantages of leaving the physical world, he replied that they are "damned few....it's less a matter of advantage than inevitability." Slouka wisely calls our attention to this claim before it becomes a self-fulfilling prophecy.

Misrepresenting the Net

But although Slouka's paeans on the superiority of reality over artificiality are compelling, his attempts to illustrate his arguments with concrete examples of Internet behavior are less so. First of all, he misrepresents the Net by ignoring some of its best and most popular features. The only discussion groups he mentions are "alt" (alternative) groups, such as alt.satannet and alt.hangover, which are known to be the dregs. He entirely ignores the fact that there are groups for thoughtful discussion of literature, philosophy, and all branches of science. Likewise, Slouka never mentions the popular World Wide Web, which contains artwork, scientific and literary publications, and, incidentally, a panel discussion on virtual communities in which Slouka is a participant.

After dismissing discussion groups, Slouka takes aim at MOOs, virtual communities where users create and manipulate characters and places. Many players view their favorite MOO as a second home and spend considerable time enhancing the virtual environment, interacting with other people, and even engaging in cybersex (which is like phone sex, only with a computer key-



board). This, and future enhancements promised by *Future Sex* magazine, greatly disturbs Slouka, who rails that a virtual embrace is not a real embrace. What he fails to recognize is the distinct possibility that most participants in virtual embraces would prefer the real thing, if only the opportunity were available and there weren't physical risks. They don't necessarily believe virtual sex is better than or the same as real sex; they may just consider it better than the options available to them.

Slouka also criticizes the lack of diversity to be found on the Net, when the truth is that a wide variety of intelligent opinions are available there. Political and nonprofit groups have flourished, able to easily present their material to others; Amnesty International reports are as accessible as corporate product information. Firms with large PR and advertising budgets no longer have a monopoly on reaching the masses. To be sure, companies will become more of a presence online as money-making applications of cyberspace develop, but the Internet will still be available to others as an inexpensive channel for mass distribution of information.

Finally, Slouka's repeated statement that what one finds online are not "real" friends or "real" communities is ques-

tionable. Just as one can experience real friendship with an old-fashioned penpal, one can do so through the Net. What's more, communities form online that would be impossible in physical space. For instance, female computer scientists are too geographically dispersed to have a physical community, but through cyberspace they can readily share news and give one another advice.

Slouka is rightly disturbed, however, by some cyberists' contempt for the material world in general and the body in particular, which they scornfully refer to as "meat." Such contempt is not new—MIT professor emeritus Joseph Weizenbaum wrote 20 years ago about hackers so obsessed with the computer that they became "oblivious to their bodies and to the world in which they move"—yet instead of discussing the history of this mind-set in computer subcultures, Slouka chooses to concentrate on deconstructionism, a literary theory that claims a text has no objective meaning but only subjective interpretations. Cyberspace, he writes, represents "the marriage of deconstruction and computer technology—a mating of monsters if ever there was one," and he goes on not so much to analyze the situation as to blame feminism and complain about cyberists' "airy, relativistic attitude [and] their complete disinterest in, if not animosity toward, the hard facts of history." His complaints are ironic in light of his own ignorance of the history of (male-created) computer cultures.

War of the Worlds is worth reading nevertheless. The immensity of recent and upcoming technological advances makes it vital to consider their effects on our worldview, and while Slouka's book paints too dark a picture, it does point out that some of the technological futures advocates have hailed are really dystopian. One only wishes the author had balanced his uncompromising love for the real world with some careful attention to the realities of virtual worlds. ■

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Phenomena

By DAVID BRITTAN

The Yes Millennium

By the year 2000, I plan to be twice as witty, half again as athletic, and several years younger than I am today. The new 80 percent wealthier, 50 percent more lovable me—fluent in six languages and second to none at table tennis—will greet the millennium with double the brain capacity, triple the sex appeal, and the single most widely read column in American journalism. I call this little scheme Mission 2000. It's an ambitious plan, I know; if I had called it Mission '98 or Mission 2003, you might have doubted my realism, or even my sincerity. But like countless others before me, I have timed the moment of my perfection to coincide with the big triple zero, a year in which, evidently, physical law will be suspended, and one should not be surprised to see pigs flying or all manner of corporate and educational excellence being achieved. You will note a certain buoyancy in some of the stated goals. I have therefore taken the liberty of naming the year 2000 the Yes Millennium, and invite others to appropriate this term in conversation.

The approach of the Yes Millennium poses a challenge for those of us who plan to take advantage of its unique properties. For while the time available for meeting our expectations gets smaller and smaller, the expectations themselves do not. In 1888, when the social critic Edward Bellamy published his utopian novel *Looking Backward*, the year 2000 seemed like eons away—more than long enough for the United States to establish a beneficent socialist system based on cooperation and abundance. By the time

Arthur C. Clarke penned his famous space odyssey, the millennium was less than four decades off. If the book's title overshot the magic number, it was perhaps because 2001 is technically the start of the millennium, but more likely because Clarke realized people would need the extra year to set up routine shuttle service to the moon and evolute into a race of Star Children.

Now here we are, just a presidential term—a mere olympiad—away from the target date. Let's see if anybody's nervous. Not the Transformation 2000 Network, a California-based group that seems perfectly at ease with the timetable set by Bellamy. Its goal for the millennium: "shifting the focus of humanity from conflict and scarcity to cooperation and abundance." Is there an echo in here? A company called Retro Aerospace (Berkeley, Calif.) is right on track for an Arthur C. Clarke-style moonfest. The aim of its Lunar Millennium program is "to establish a permanent manned presence on the moon by the year 2000." There follows the tag line "within realistic budgetary constraints"—which is really the key to making this whole Yes Millennium thing work. The government of Taiwan isn't shy either, having selected 2000 as the deadline for achieving zero population growth. And the title of Amnesty International's recommendations for the September 1995 UN World Conference on Women—"Equality by the Year 2000?"—is only a question mark away from suggesting that the status of half the world's people can be elevated in the space of four years and three months.

For the World Health Organization, the millennium seems to hold miraculous healing

powers. Although WHO has rolled back its schedule for achieving a smoke-free world, it reportedly stands by the broader goal it set in the late 1970s: "Health for all by the year 2000." Health, astoundingly, is defined as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." So anyone whose well-being is less than complete should definitely not miss the year 2000.

And what of the future—the very near future—of education as the celestial year bears down upon us like one of Clarke's black monoliths? Here is some of the bounty prophesied by the federal Goals 2000 Act, signed into law in 1994: • "The high school graduation rate will increase to at least 90 percent." • "United States students will be the first in the world in mathematics and science achievement." • "Every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship." • "Every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning." Sounds like heaven.

In fact, the agenda for the year 2000 bears more than a passing resemblance to the Millennium of God foretold in the Book of Revelation. Although theologians through the ages have debated the specifics, all have agreed on one thing: the thousand years of heavenly reign will be *excellent*. Thomas Burnet, a scholar writing in 1685, foresaw a world graced by abler

minds, stronger bodies, extended life spans, cleaner (more "salubrious") air, enhanced soil quality, and a more stable (or "paradisical") climate. The only real difference between this vision of excellence and today's millennial wish list is that Burnet, perhaps sensing the potential for egg on the face, left the timing to God. In the secular version, excellence has been pursued right to the end of the millennium, where it now stands cornered and, it is hoped, ready to cooperate with authorities. That so many forms of excellence will come due at precisely the same moment promises to make 2000 the most exciting year ever. Otherwise, the size of the egg and the number of faces to which it might adhere would be too ghastly to contemplate.

Despite a few *fin-de-siècle* jitters, my own Yes Millennium scheme, the much-talked-about Mission 2000, is coming along nicely. Phase One—the acquisition of Berlitz tapes—ended last month, right on schedule. Phase Two will culminate in 1998 with the purchase of a Thighmaster. Will I be ready to assume the mantle of excellence when the big ball descends on the new millennium? Yes. Oui. Ja. Hai. Sí. Da. ■



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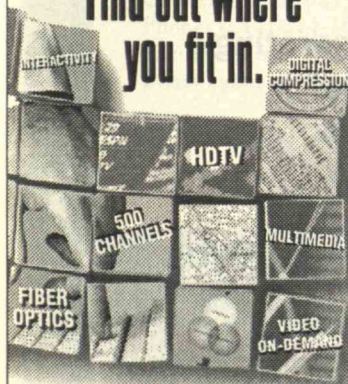
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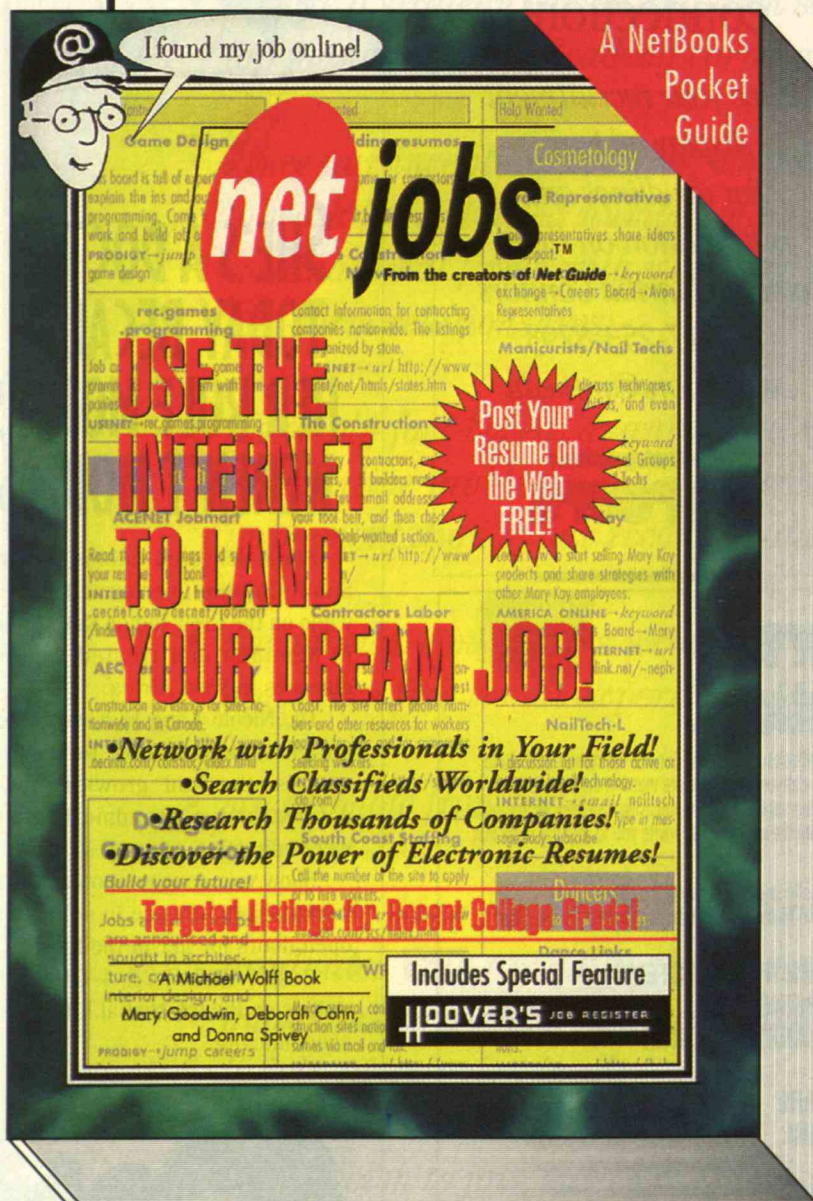
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